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(1948-49)

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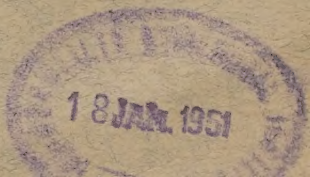

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Introductory :

1. *Administration:*—I continued to be in charge of the Research Department of the Indian Coffee Board throughout the year. Dr. N. G. Chokkanna whose services were loaned by the Mysore Government for a period of three years from May 1947 continued to be Chemist except for two periods comprising a total of one month and one day during which he was on privilege leave. Mr. S. Sundaram, the Agronomist, loaned by the Madras Government for two years was in charge of the sub-station at Chethalli (Coorg) throughout the period. Mr. T. V. Pattabhiraman, who was drafted from the U. P. A. S. I. Research Station, Sidapur (Coorg), officiated as Assistant Plant Pathologist for the whole year. The services of Mr. R. L. Narasimhaswamy who was Geneticist, Coffee Experimental Station, Balehonnur, were placed at the disposal of the Indian Coffee Board for appointment as Assistant Botanist for a period of three years and assumed charge as Assistant Botanist during the period. The loan of Messrs. H. N. Gundappa, A. B. Achiah and T. H. Thimme Gowda from Mysore service for three years for appointment as Farm Assistant, Mechanic and Fieldman respectively, was regularised in G. O. No. A. F. 6784-6 Agri-220-48-2 dated 9th May 1949. Mr. A. T. Joseph joined duty as Head Clerk-Accountant on the 15th January 1949. A few posts of clerks and fieldmen were filled during the year.

2. There were no major additions to or alterations in the area comprising the two stations or in the distribution of crops. Arrangements were under way at Chethalli to replant with arabica selections eight acres of old coffee cut out during 1947. Out of this area, 2½ acres have since been planted with arabica selections from Balehonnur; one acre with seedling material under the seed multiplication scheme; 2½ acres under a bulk crop of seedlings raised from S. 288; one acre with inter-specific crosses between selections of robusta made at Margolly estate and the F_3 generation progenies of the intra-specific hybrids between robusta and arabica, and the remaining area of one acre was planted with robusta selections.

3. Finance:—A financial statement for the year ended 30th June, 1949 is appended. (Appendix I).

4. Season and Crop :

(a) *Central Station, Balehonnur (Mysore)*---The total rainfall received during the year was 111.43 inches as against the average of 101.85 inches during the previous ten years. The S. W. monsoon of 1948 set in on the 12th of June and continued to be fairly active till the 26th of July when a break occured. Bright mornings and warm afternoons continued till the 5th of August when once again wet weather set in and continued till the 9th of September, weakening thereafter. The N. E. monsoon brought about a precipitation of about 15 inches in October and November. December, January and February were dry months, and this weather continued till the 22nd of March 1949, when the first hot weather showers fell. This abnormal drought of 116 days' duration not only hastened the ripening of the standing crop of coffee but also favoured the rapid 'wintering' of the coffee bushes. A blossom shower of 44 cents received on the 22nd March brought out the major part of both the arabica and robusta blossom. This was followed by 2.09 inches of rain in early April of which 51 cents received on the 5th April was practically in the form of a hailstorm. Consequent on the insufficient first rain received in March, the blossom appeared in two instalments, the first of which opened on the 29th, 30th and 31st March; but a minor blossom appeared about the 16th April bringing out about thirty per cent of the total. While the rainfall was adequate to meet the water requirements of the crop at a critical stage, the hail-storm did considerable mechanical damage to the newly set blossom and to the bushes in general. The S. W. monsoon of 1949 broke out unusally early in mid-May which was about a month ahead of the normal period, with the result that some fair-weather operations like spraying were held up. Fortunately, the first and untimely onslaught of the monsoon was followed by a break from the 9th to the 20th of June and spraying operations which were behind schedule were resumed and practically completed before the next spe l The standing crop was estimated at twelve tons.

(b) *Sub-station, Chethalli (Coorg)*—The year recorded a rainfall of 68.18 inches as against the annual average of 75.95 inches over the past ten years. Rains were below normal by about 11 inches in July, but exceeded the average in August by about 9 inches. The next three months had 4 inches less, while in May 1949, it was more by 7 inches. The weather conditions were on the whole favourable to the coffee bushes in bearing. The 1948-49 crop came into picking early in October and finished off by the end of January. Blossom showers were received early in April following the dry weather from the middle of November. The weather conditions that followed were favourable for good setting in both arabica and robusta. The estimated crop for arabica for 1949-50 is about twelve tons and robusta about half a ton. The rainfall statements

of the two stations and the summary of other meteorological observations for Balehonnur are appended. (Appendices II and III).

5. Expansion and extension of activities :—Besides the completion of two blocks of modern labour quarters, the construction of an additional laboratory and annexe estimated to cost Rs. 92,000 was taken up during the year. Thanks to intermittent breaks in the monsoon, this construction work proceeded ahead of schedule and the foundation and part of the brick work were completed during the period under report. Pending the completion of this two storeyed building and an annexe which it is designed to connect it to the existing laboratory, all available space in the existing laboratory and one set of rooms in the second class rest-house were utilised to accommodate the laboratory and offices. Additional space in the shape of three rooms was provided by enclosing a spacious verandah of the old laboratory. The absence of a chemistry laboratory in the old building was partially remedied by the construction of a fume cup-board, provision of additional work tables and the purchase of essential laboratory equipments sufficient to make a start with organised chemical research. A sum of Rs. 3,798 was spent on additional laboratory equipment and furniture besides Rs. 6,865 invested on this item during the previous year, and it is hoped that all the accommodation and equipment necessary for the offices and laboratories will be available by the end of May 1950.

RESEARCH

I. BOTANY

6. The chief items of work done during the year consisted in following up the previous breeding work done at Balehonnur, raising of foundation stocks of breeding material for the sub-station and the multiplication of promising plant material by rooting of sucker cuttings. Based on the success of rooting of cuttings recorded in the last report, large-scale efforts were made at both the stations to obtain rooted cuttings and to improve upon the technique.

A. Breeding.

7. Arabica :—The main feature of the year's work at Balehonnur consisted in producing back crosses with existing cross-bred progeny with a view to improve the yield, to reduce the bean defects and in the case of crosses in which Maragogype is a parent, to eliminate the abnormal sized beans. The following table summarises plant breeding work done at Balehonnur.

TABLE I.—Breeding of Arabica Coffee at Balehonnur (Mysore).

No.	Method	Purpose	Procedure adopted	Remarks
1	Selfing of desirable types.	To produce seed for regional nurseries.	(a) Thirty seven plants in S. 795 family (sibs 1 to 37) were covered with muslin bags when they were in blossom.	
			(b) Forty five plants in S. 645 family (sibs 1-45) were covered with muslin bags when they were in blossom.	
			(c) Forty seven plants in S. 838 family (sibs 1-47) were covered with muslin bags when they were in blosssm.	
2	Hybridisation between two desirable parents.	To obtain more promising material than either parent.	(a) Blossom was forced on 32 plants of S. 531 and the flowers were pollinated with pollen from S. 451 (Kent).	S. 531 is a high yielder with resistance to races 1 & 2 of *Hemileia*, but with roundish beans Kent is resistant to races 1 and 3 of *Hemileia* and has a high percentage of A grade beans.
			(b) Blossom was forced on S. 26 mother plant and 16 clonal progeny from it and the flowers were pollinated with pollen from S. 451 (Kent).	do
3	Hybridisation between promising selections.	Search for new combinations.	1. (a) 328-3 x S. 26. (b) do x Kent.	Back-cross with female parent.
			2. 288-53 x 763-2/8.	do
			3. 763-2/8 x 288-23.	do
			4. 947-1/14 x 959-1/4 & reciprocal	Back-cross of F_2 with 5th gen. of S. 26 (female parent).
			5. 959-2/4 x 947-2/4.	
			6. 958-1/9 x 947-1/14.	Back-cross of F_2 with 3rd gen. of S. 288 (female parent).
			7. 958-3/2 x 947-2/7 & reciprocal.	
			8. 824-1/1 x 645-2/11.	
			9. (a) 333-4 x 786-1/13 & reciprocal. (b) 333-4 x 773-2/15 & reciprocal.	Back-cross with female parent.
			10. (a) 778-2/7 x 333-4.	
			11. 776-2/12 x 333-8.	
			12. (a) 779-2/10 x 333-8. (b) 779-2/10 x 645-2/11 & reciprocal.	
			13. 645-2/11 x 776-2/12 & reciprocal.	
			14. (a) 558-9/1 x 574-3/7 & reciprocal. (b) 558-9/1 x 333-4.	
			15. 775-1 x 574-3/7 & reciprocal.	

No.	Method	Purpose	Procedure adopted
4	Selections from self-bred progenies of hybrids	For making further selections	1. Selections from 3rd & 4th selfed gen. of S. 26. 2. do 2nd selfed gen. of S.44. 3. do 1st selfed gen. of S.48. 4. do F_1 of (a) S. 26 x S. 47. (b) S. 26 x S. 48. (c S. 26 x Kent. 5. do 3rd gen. of S.26 x Kent 6. do (a) S. 288-23 x (S. 288-23 x Kent) (b) S. 288-23 x (S.288-23 x Maragogype) (c) S. 288-20 x S. 260-1/12 & reciprocal. (d) S. 288-53 x Excelsa. 7. do 2nd gen. of (a) S. 288-23 x Marago. (b) S. 288-23 x Kent. 8. do 3rd gen. of S. 288-23 x Kent. 9. do (S. 288-23 x Kent) x (S.288-23 x Marago.) 10 do (S. 288-23 x Marago.) x (S. 26 x Kent) 11. do 1st gen. of S. 31 x S. 359-2/7. 12. do 1st gen. of S.22 x S.31. 13. do 1st gen. of S. 44 x S.359-2/7. 14. do 1st gen. of S. 353-17/2 x 333-4. 15. do 1st gen. of (a) S. 48 x S. 31 (b) S. 48 x S. 22 16. do 1st gen. of S. 360-1/12 x 333-4. 17. do (S. 353-15/7 x Marago.) x Kent. 18. do F_1 of robusta x arabica.

8. At Chethalli, seeds from the following arabica selections were sown in the nursery for raising foundation stock of these hybrids for future breeding work.

S. 446; S. 795; S. 702; S. 288; S. 643 and S. 838.

Besides these, seed progenies of the following selections and crosses were raised for the regional nursery :

S. 288; S. 795; S. 531 X Kent; S. 645 and S. 26 X Kent.

Under replicated trials the selections S. 446 (Control), S. 795, S. 288 and S. 645 were laid out in latin square design.

Devamachy hybrids—A further selection of 36 plants was made in this naturally occuring arabica-robusta hybrid. Open pollinated seeds from selections D. 4, D. 8, D. 13, D. 15, D. 20, D. 23, D. 26 and D. 32 collected from the above hybrids were sown in the nursery. Progenies of crosses between select Devamachy hybrids and Kent, as also between these hybrids and robusta were raised for further study.

9. **Field studies of advanced generations of hybrids:** Seedlings raised from the following were planted at the main station for character studies:

Seeds produced from	*No. of seedlings transplanted*
4th generation of S. 26	64
F_3 of S. 288 X Maragogype	144
F_3 of S. 288 X Kent	339
F_3 of S. 288 X Kent	64
2nd generation of S. 288 X (S. 288 X Maragogype) ...	32
2nd generation of Maragogype X (S. 288 X Maragogype) ...	78
F_2 of (S. 288 X Maragogype) X Kent	128
(S. 288 X Kent) X Kent	24
F_2 of do	128
2nd back-cross of S. 288 X Maragogype with S. 288 ...	64
F_2 of S. 288 X (S. 288 X Maragogype)	48
F_2 of (S. 26 X Kent) X (S. 288 X Maragogype) ...	64
2nd generation of S. 31	160
3rd generation of S. 31	20
F_2 of S. 31 X S. 22 (Coorg)	40
2nd back-cross of Robusta X Kent with Kent ...	112
3rd back-cross do do	64
2nd selfed generation of *Coffea arabica* (wild plants from East Africa)	178
Other selections	127

A further batch of seeds raised from the following were sown in the nursery for subsequent transplanting in the field and eventually to study their characters:

Seeds produced from	*No. of seedlings raised*
4th generation of S. 26 ...	653
5th generation of S. 26 ...	1654
F_4 of S. 26 X Maragogype ...	666
F_4 of S. 288 X Maragogype ...	1739
4th generation of S. 31 ...	858
S. 645 X Maragogype ...	122
S. 645 X (Robusta X Kent) ...	288
S.645 X [(S.288 X Marag.) X (S.26 X Kent)]	296
S. 645 X (S. 26 X Robusta) ...	35
S. 645 X [Kent X (Robusta X Kent)] ...	12

Seeds produced from		*No. of seedlings raised*
C. arabica X (Robusta X Kent)	...	193
C. arabica X (Kent X Congensis)	...	29
C. arabica X S. 31	...	36
Maragogype X (Robusta X Kent)	...	38
(Robusta X Kent) X Kent	...	32
[Kent X (Robusta X Kent)] X Kent	...	36
do. X Coorg	...	64
elections from Devamachi Hybrids	...	1768
Other selections.	...	154
	TOTAL ...	8,673

Character studies:—The produce from the promising selections of arabica was analysed for yield, out-turn, lights, triage and the percentage of various grades. The following table gives a summary of the studies made during the last three years.

TABLE II.—Some character studies of arabica and robusta selections.

Serial No.		Percentage of triage			Percentage of 'A' Grade beans			Percentage of peaberry			Weight of 100 'A' grade beans in grammes		
		1947	1948	1949	1947	1948	1949	1947	1948	1949	1947	1948	1949
	Arabica selections												
1	S. 26 (Clones) ...	36.8	22.5	12.6	40.2	21.3	28.0	15.1	37.6	24.0	18,7	18.5	14.3
2	S. 31 (Clones) ...	35.3	11.4	8.9	44.9	51.2	31.2	11.4	23.9	38.3	17.8	17.8	17.2
	Robusta selections												
3	S. 274-3/13 ...	1.5	8.2	3 4	6.1	49.3	13.6	3.3	26.0	7.3	17.1	19.4	18.8
4	S. 274-2/12 ...	0.8	4.5	4.7	7.3	1.1	13.6	17 8	25.0	8.2	19.2	16.6	20.8

It is observed from the above table that even with selections which constitute single plants or clonal material raised from one mother plant such characters as percentage of triage, percentage of 'A' grade beans, formation of peaberry and the density of the beans vary widely from year to year. This points to the influence of factors other than the genetic constitution of the plants in the production of various grades and in determining the specific gravity of the produce.

TABLE III Yield records of some Balehonnur Arabica selections.

Serial no.	Selections	Year of planting	Calculated yield of ripe cherry in lb. per acre (1200 plants) during				
			1945	1946	1947	1948	1949
	FAMILY S. 26.						
1	S. 26 (clones) ...	1940	3636	1419	3930	3186	*324
	(a) SELF BRED PROGENY OF S. 26.						
2	S. 288 (F_1 of S. 26) ...	1932	5614	3265	1606	4146	1330
3	S. 329 do ...	1934	4021	2287	2010	3905	Not recorded
4	S. 792 (F_2 of S. 26) ...	1941	...	2201	1715	5547	435
5	S. 794 (F_3 of S. 26) ...	1941	...	973	1142	1848	341
6	S. 838 do ...	1942	...	...	4406	*919	*412
7	S. 840 do ...	1942	...	...	543	4763	687
8	S. 743 do ...	1940	3096	485	460	4984	1688
9	S. 744 do ...	1940	1019	22	534	3074	367
10	S. 745 do ...	1940	4573	203	784	3384	1522
11	S. 746 do ...	1940	2312	42	1055	1917	518
12	S. 945 (F_1 of S. 26) ...	1944	...	...	...	...	1050
13	S. 947 (F_3 of S. 26) ...	1944	...	...	...	...	1871
14	S. 948 do ...	1944	...	...	...	...	1047
15	S. 951 (F_4 of S. 26) ...	1944	...	...	...	...	969
16	S. 952 do ...	1944	...	...	...	...	627
17	S. 954 do ...	1944	...	...	...	...	1045
18	S. 955 do ...	1944	...	...	...		1363
	(b) CROSSES WITH S. 26.						
19	S. 327 (F_1 of S. 26 x Kent) ...	1934	7840	2540	3525	4128	1424
20	S. 737 (F_2 of S. 288-23 x Coorg) ...	1940	2324	138	583	1607	697
21	S. 738 do ...	1940	3858	631	485	2806	1397
22	S. 739 (F_2 of S. 288-23 x Kent) ...	1940	2493	590	1078	3119	792
23	S. 795 do ...	1941	...	5414	2430	4688	*117
24	S. 796 (F_3 of S. 26 x Kent) ...	1941	...	2486	1795	3509	1441
25	S. 705 (S. 474 x S. 520) ...	1940	2168	470	1800	2248	1640
26	S. 704 (S. 288-23 x S 522) ...	1940	3176	1808	2333	2155	2437
27	S. 702 do ...	1940	4532	1859	164	2258	3144
28	S. 700 (S. 26 x S. 288-23) ...	1940	3641	1755	370	1916	2307
29	S. 699 (S. 26 x S. 359-2/7) ...	1940	4429	507	21	2274	1783
30	S. 759 (S. 288-53 x S. 360-1/12) ...	1941	...	2429	847	4438	651
31	S. 765 (S. 288-23 x Marag) ...	1941	...	2440	1232	3432	1853
32	S. 766 (S. 523 x S. 288,23) ...	1941	...	1417	1114	2542	1135
33	S. 784 (S. 360-1/ 12 x S. 288-20) ...	1941	...	3159	437	4254	704
34	S. 822 (S. 327 x S. 517) ...	1942	...	...	335	2814	470
35	S. 823 (S. 327 x S. 395) ...	1942	...	...	77	2193	581
36	S. 824 (S. 517 x S. 327) ...	1942	...	...	1216	4359	1523
37	S. 825 (S. 517 x S. 327) ...	1942	...	...	1336	4702	2320
38	S. 826 (S. 26 x S. 327) ...	1942	...	...	763	4977	1600
39	S. 959 (F_3 of S 26 x Marag) ...	1944	...	...	...	...	676
40	S. 960 do ...	1944	...	...	...	...	646
41	S. 961 (F_3 of S. 288-20 x Marag.)..	1944	...	...	...	...	1363
42	S. 965 (F_3 of S. 288-23 x Marag.) ...	1944	...	...	...	...	604
43	S. 966 (Reciprocal of above) ...	1944	...	...	...	...	705

Serial No.	Selections	Year of planting	Calculated yield of ripe cherry in lb. per acre (1200 plants) during				
			1945	1946	1947	1948	1949
	FAMILY S. 31						
44	S. 31 (clones)	1940	4380	2993	4626	6128	2257
	SELFBRED PROGENY OF S. 31						
45	S. 644 (F_2 of S. 31)	1939	2237	3683	3841	6722	1505
	CROSSES WITH S. 31						
46	S. 333 (F_1 of S.31xS.22)	1934	12075	5196	6886	6750	4250
47	S. 706 do	1940	3571	1266	2053	2585	2213
48	S. 645 (F_2 of S.31 x S.22)	1939	2295	4501	4399	4349	1048*
49	S. 770 (S.31 x S.333-8)	1941	...	1965	1466	2360	1232
50	S. 773 (S.333 x S.360-1/12)	1941	...	3146	971	3651	690
	OTHER SELECTIONS						
51	S. 433 (F_1 of S. 72)	1935	2112	1589	1417	1671	1303
52	S. 434 (F_1 of S. 73)	1935	3763	996	1686	1120	2089
53	S. 749 (F_2 of S. 72)	1940	1706	394	743	2683	422
54	S. 574 (F_2 of S. 44)	1938	1852	2266	2803	1998	205

* The yields of these selections have been adversely affected by the unavoidable mechanical injuries sustained in covering the trees with muslin bags.

10. Robusta: At Balehonnur an attempt was made to raise as large a number as possible of rooted cuttings of robusta selection S.274, in order to obtain planting material without loss of parental characters from a selection which has proved a consistently high yielder with bold bean size. The analysis of yields of the robusta selections obtained at Balehonnur is given below:

TABLE IV—Yield record of some Balehonnur robusta selections

Serial No.	Family No.	Year of planting	Calculated yield of ripe cherry in lb. per acre (680 plants) during					
			1945	1946	1947	1948	1949	Average for five years
1	S. 271	1931	2515	2347	2550	7565	623	3120
2	S. 272	1931	3813	1663	5105	7464	1024	3814
3	S. 273	1931	4059	2094	4888	6276	1082	3680
4	S. 274	1931	7339	3810	11024	9939	3743	7171
5	S. 275	1931	4588	3438	5842	9712	1046	4925
6	S. 276	1931	6731	5412	5383	8503	1519	5510
7	S. 277	1931	4386	4165	3979	8257	1394	4436
8	S. 278	1931	3029	2366	4043	3428	1384	2850

The yield figures also point to a fluctuation in the yield levels which is only partially attributable to seasonal factors. Among the selections the high yield level of S.274 is more consistent than the rest. During the year the yield of this selection in terms of clean coffee works out to 6.68 cwt. per acre as against 17.8 cwt. per acre in the previous year.

The sub-station made further selections of promising material in the robusta block at Margolli estate. The following is a list of material collected and raised at Chethalli.

Rooted cuttings from Robusta selections Nos.		*Seedlings raised from open pollinated flowers of selections Nos.*	
25-5	52-36	23-5	59-9
28-6	53-8	25-5	61-20
36-21	57-2	28-6	42-25
36-39	58-16	36-9	53-33
39-36	58-31	39-42	57-2
46-20	59-9	51-23	63-14
46-22	63-8	55-5	53-28
49-28		58-14	58-14
		49-28	58-31
		53-33	63-8
		55-16	

Besides these, seedlings from open pollinated S.274 and bulk robusta from Balehonnur were raised in beds.

11. **Intra-specific hybrids in robusta** :—The work started at Sidapur last year for obtaining prolific hybrids in robusta was pursued. Eight trees selected out of 1,800 in Margolly estate, which were under observation during the last eight years and which were selected on the basis of their high yields and regularity of bearing, were divided into two sets of four each and cross pollination—both direct and reciprocal—effected between these two units. The seeds produced by this method during the last season were collected and sown in the nursery.

12. **Extension work with selections** :—The following quantities of seeds produced at Balehonnur station were distributed during the year.

TABLE V.—Quantities of seeds prepared for distribution during the year.

Arabica selection	Quantity		Arabica selection	Quantity	
	lb.	oz.		lb.	oz.
S. 288 ...	36	11	S. 433 ...	7	4
S. 947 ...	14	11	S. 434 ...	22	10
S. 948 ...	2	0	S. 702 ...	0	8
S. 949 ...	4	0	S. 704 ...	0	8
S. 950 ...	2	4	S. 333 ...	7	0
S. 951 ...	8	2	S. 327 ...	7	6
S. 952 ...	6	4	S. 645 ...	10	8
S. 953 ...	4	14	S. 838 ...	2	0
S. 954 ...	8	2	S. 26 x Kent ...	1	8
S. 955 ...	7	0	S. 531 x Kent ...	0	8
S. 840 ...	2	2	S. 795 ...	3	12

	lb.	oz.
Total for Arabica ...	159	10

Robusta Selections

S. 274 ...	54	1
Total for Arabica and Robusta ...	213	11

13. The following table gives the distribution todate of selected seed.

TABLE VI.—Distribution of selected seed in coffee growing tracts and quantities of seeds supplied.

Serial No.	*Name of tract*	*Quantity of seeds supplied*			
		Arabica		*Robusta*	
		Lb.	*oz.*	*Lb.*	*oz.*
1	Bababudangiri ...	27	0	6	4
2	Aldur ...	1	8	...	...
3	Mudigere ...	13	2	5	10
4	Saklaspur ...	14	12	0	10
5	Balehonnur-Koppa ...	18	14	3	12
6	Biligiris ...	3	0	...	...
7	Sagar ...	0	12	...	...
8	Coorg ...	25	14	21	4
9	Nilgiris ...	4	14	...	...
10	Malabar ...	0	14	...	...
11	Wynaad ...	7	10	7	8
12	Cochin ...	2	4	3	12
13	Shevroys ...	11	14	2	3
14	Anamallais ...	1	2	...	...
15	Travancore ...	1	10	...	...
16	Vizagapatam ...	2	0	...	...
17	Rajahmundry ...	0	4	...	...
18	Bengal (East) ...	1	0	...	...
19	Assam ...	0	10	...	...
20	Punjab (Kangra Valley) ...	0	14	...	...
21	Belur ...	5	8	0	10
22	Tinnevelly ...	0	14	...	...
	Total ...	146	4	51	9

14. **Regional Nurseries**:—To meet the ever increasing demand for planting material from the selections at the research stations, a scheme of regional nurseries was inaugurated during the year under report. The object of the nurseries is to raise in representative tracts planting material from seeds and eventually from clonal material supplied by the research stations. These nurseries would function as seed and plant distributing centres for coffee growers within their own tract and from where progressively increasing quantities would be available to them in succeeding years. Thirteen such nurseries were functioning during the year. The location of nurseries and the quantities of seeds supplied are furnished below:

TABLE VII.—Situation of Regional nurseries and quantity of seeds supplied to them (in ounces)

Situation	Arabica selections							Robusta S. 274
	S. 288	S. 949	S. 645	S. 795	S. 838	S. 526 × Kent	S. 531 × Kent	
MYSORE								
Coffee Research Station Balehonnur P. O. ..	...	...	12	5	2	4	4	...
Galikere Estate, Bababudangiri, Chikmagalur P. O. ...	...	...	11	3	...	4	...	...
COORG								
Coffee Research sub-station, Chethalli P. O. ...	...	...	24	10	...	4	4	60
Nullore Group, Suntikoppa P. O. ...	...	...	11	3	4	...	...	...
Madapur Group, Madapur P.O. ...	...	...	11	3	4	...	...	...
MALABAR								
Wynaad Colonisation Scheme, Vatuvanchal P. O. ...	32	32	11	3	...	4	...	120
COCHIN								
Govt. Fruit & Vegetable Farm Nelliampathies, Sitharkunda P.O. ...	...	...	11	3	4	...	...	60
NILGIRI-WYNAAD								
Glenvans Estate, New Hope P. O.	...	...	11	3	...	4	...	...
NILGIRIS								
Adderly Estate, Coonoor P. O. ...	...	...	11	3	...	4	...	...
COIMBATORE								
Honnametti Estate, Biligiris Attikan P. O. ...	...	...	11	3	4	...	...	...
Waterfall Estate, Attakatti P. O.	...	...	11	3	4	...	...	...
SHEVROYS								
Hawthorn Estate, Yercaud P.O.	32	...	11	3	4	...	...	35
VIZAGAPATAM								
Araku Valley Scheme, Araku P.O.	...	...	11	3	4	...	...	...
Total ...	64	32	157	48	30	24	8	275

B. Vegetative Propagation.

15. Large scale multiplication of desirable mother plants by the rooting of single noded leafy soft-wood sucker cuttings was taken up during the year. The cuttings were normally planted in propagation chambers, but during the rainy months, open sand beds were also used.

The chambers as well as beds were provided with overhead cloth cover to avoid excessive sunlight falling on them. During nights and rainy and cloudy periods of the day the cover was removed. The rooting medium both in the chambers and in the nursery beds was well washed river sand. Prior to the planting of cuttings the sand was watered with Cheshunt compound.

16. **Pre-curing of cuttings**:—As a modification of the planting of sucker cuttings removed directly from the mother plant, a system of 'pre-curing' of the 'suckers' was adopted with success. The internodes of standing suckers were rung three to four inches below each node, the bark lifted and the wound smeared with cow's urine extract and bandaged with a ring of moss. After a fortnight to twenty days by which time callusing had commenced at the ring, these suckers were detached from the mother plants and cuttings prepared with the lower cut immediately below the callus. Such pre-cured cuttings were planted in propagation chambers or in open sand beds. The cuttings were given a "quick dip" treatment with cow's urine extract before planting. It was found that with sufficient practice, a skilled workman could do on an average 150 'aerial marcots' per day which suggests that pre-curing of suckers can be adopted as a routine operation. The success of this operation ranged up to 83 per cent rooting and about 2,400 rooted cuttings were obtained by this method. It is, however, too early to state that under identical conditions this method would be superior to the direct planting of cuttings.

17. (i) **Experiment with plant hormones: Balehonnur, (Mysore).**—Based on the beneficial effects obtained last season at Sidapur in the use of cow's urine extract on robusta cuttings planted during the monsoon in open beds, a similar trial was conducted at Balehonnur with arabica cuttings. But the results given below do not corroborate the observations made at Sidapur.

TABLE VIII.—Effect of natural and synthetic hormones on single-noded leafy sucker cuttings of Arabica during monsoon.

Locality: Balehonnur (Mysore) *Medium*: Open sand beds

Date of planting: 28th August 1948 *Date of observation*: 26th December 1948.

	A	B	C	D	E
	Control	Indole-butyric acid	Indole-acetic acid	Bamboo-bud extract	Cow's urine extract
No. of Cuttings planted ...	100	200	202	152	205
Percentage of cuttings rooted ...	77.0	63.0	50.99	55.13	56.1

It is not possible at this stage to state whether the difference is due to the species of coffee used or other undetermined factors. It is therefore proposed to carry out further trials at both stations using cuttings from both species.

(ii) Chethalli (Coorg):—The relative merits of natural and synthetic plant hormones in inducing rooting and callus formation of sucker cuttings were studied. Ninety single-noded leafy sucker cuttings under each treatment were dipped in the hormone preparations for two seconds and planted side by side with control. The results are furnished below :

TABLE IX.—Effect of natural and synthetic plant hormones on single-noded leafy sucker cuttings.

Locality : Chethalli (Coorg)
No. of cuttings per treatment : 90
Date of planting : 3rd August 1948
Variety : Arabica (Coorg).
Medium : Sand in propagation chambers.
Date of observation : 27th April 1949.

Serial No.	Treatment	Callused and rooted — Percentage	With callus only	Total callused percentage	Treatment average %	Remarks
1	Indole-butyric acid 4 mgm per cc.	48 8	7.9	56.7	61.9	Rooting and shoot growth fair.
	2 do cc.	61.1	11 1	72.2		
	1 do cc.	44.4	I2.3	56.7		
2	Bamboo-bud extract 3% syrup	43.3	5.6	48.9	41.1	Rooting and shoot growth poor.
	1½% ,,	42.2	7.8	50.0		
	¾% ,,	24.4	0.0	24.4		
3	Ragi coleoptile extract 6% syrup	40.0	3.3	43.3	57.4	Rooting and shoot growth very fair.
	3% ,,	55.6	4.4	60.0		
	1½% ,,	67 8	1.1	68.9		
4	Urine extract 7½% syrup	73.3	3.4	76.7	68.5	Rooting and shoot growth very good.
	3¾% ,,	50.0	6.7	56.7		
	1⅞% ,,	72.2	0.0	72.2		
5	Seradix (Talc formulation for soft wood)	57.8	5.5	63.3	...	Do
6	Seradix (Talc formulation for semi-hard wood)	44.4	14.5	58.9	...	Rooting good, but shoots poor.
7	Seradix (Talc formulation for hard wood)	46,7	11.1	57.8	...	Do
8	Control	53.3	4.5	57.8	...	Do

It will be seen from the observations that the cheapest and the most efficient source of hormone for rooting and callus formation is cow's urine extract. It is proposed to conduct a randomized replicated trial with a wider range of hormones.

C. Green Manure Crops

18. The following green manure plants were raised at both stations for observational study and the behaviour of these under local conditions. The observations are recorded in the tabular statement below.

TABLE X :—Studies on the growth and habit of some green manure plants grown in the open.

Serial No.	Green manure	Nature and habit	Flowering and seed production	Incidence of pest	Whether grazed by cattle	Remarks
1	2	3	4	5	6	7
1	*Crotalaria anagyroides*	Perennial, tall, robust, quick-growing ; height upto 10 ft.; stands periodical prunings.	Flowers and sets pods profusely from the first year.	Pest free ...	No	No pest was noted in the trials at the sub-station in Coorg.
2	*C.usaramoensis* ...	Perennial, tall, robust, but comparatively slow growing ; height upto 10 ft.; stands periodical prunings.	Flowers and sets pods in the first year profusely	do ...	No	do
3	*C.agatiflora* ...	Perennial ; failed due to insect attack	Not recorded	Highly susceptible	No	do
4	*C.lanata* ...	Perennial ; partially failed due to insect attack : height 4 to 5 ft.	Not recorded	do ...	Not relished, but occasionally browsed	do
5	*C.fulva* ...	Perennial; slow growing branching sparse ; height 4 to 5 ft.	Flowers and sets pods in the first year	Highly susceptible, but recovers slowly.	No	do
6	*C.striata* ...	Annual; short but freely branching. Height 2 to 3 ft.	Seeds profusely : flowering in the first year	Pest free ...	No	do
7	*C.grahamiana* ...	Perennial, tall, robust but comparatively slow growing; height 8 to 10 ft.	Flowers and sets pods in the first year profusely	Susceptible but withstands attack & recovers	No	do
8	*Cassia hirsuta* ...	Annual ; short & spreading ; 4 to 5 ft. in height; poor in the production of green matter.	do	Pest free ...	No	Sheds the seeds and dries up in summer.

Serial No.	Green manure	Nature and habit	Flowering and seed production	Incidence of pest	Whether grazed by cattle	Remarks
1	2	3	4	5	6	7
9	*Cassia didimobotriya.*	Perennial ; small tree, slow in growth.	Flowers in the first year but fruit setting is sparse.	Pest free ..	No	No pest noted in Coorg.
10	*Tephrosia vogelii* ...	Perennial, tall and robust ; branches freely ; height upto 8 ft.	Flowers and sets pods in the first year.	do ...	No	do
11	*T.candida* ...	Perennial ; tall and robust ; branches freely ; height upto 6 ft.	Comes to flowering in the second year.	do ..	No	do
12	*Sesbania speciosa* ...	Perennial, tall and spreading but slow growing to start with and pulls up after two months.	Flowers and sets pods in the first year and continues for the second year.	Highly susceptible to insect attacks.	No	do
13	*Indigofera dosua* ...	Perennial ; short and slow growing. not much leafy.	Has not flowered even in the second year.	Pest free ...	No	do
14	*I.arrecta* ...	Annual ; short, sparsely branching.	Flowers and pods freely.	do ..	No	do
15	*Centrosema pubescens.*	Perennial ; trailing, rooting at nodes, quick growing.	Flowers and sets pods.	do ...	No	do
16	*Phaseolus trilobus.*	Annual : trailing.	Flowers and sets pods freely.	Susceptible to insect attack.	Relished by cattle	do

II. CHEMISTRY.

19. Work in the chemistry division comprised largely of the continuation of the manurial experiments, blossom berry observation in these blocks, the experiment on inorganic catalysts and meteorological observations. Besides this, a start was made with the collection of samples of soils and manures and their analyses. The results of manurial experiments and the relevant observations made on the setting of blossom, development of berries and incidence of lights in the experimental plots are furnished below :

TABLE XI—Yield records of Permanent Manurials, Coffee Research Station, Balehonnur.

Area of experimental block : 76 cents. Layout : Latin square.
No. of plants per sub-plot : 5 x 8. Spacing : 5 ft. x 5 ft.
Variety : Kent's Arabica. Guard-rows : One row all around the block.

Year	Average calculated yield of ripe cherry in pounds per acre					Signi-ficant or not	Critical difference (P = 0 05)	Conclusions
	TREATMENTS							
	N A	N+P B	N+K C	N+P+K D	Control E			
1941 ...	791	663	918	918	553	No	513	C,D,A,B,E
1942 ...	1250	1207	1335	1360	740	Yes	436	D,C,A,B,E
1943 ...	60	89	113	85	43	Yes	16	C,B,D,A,E
1944 ...	255	213	306	264	204	No	147	C,D,A,B,E
1945 ...	1267	1233	1662	1913	803	No	1168	D,C,A,B,E
1946 ...	400	531	332	595	510	No	411	D,B,E,A,C
1947 ...	468	697	714	697	587	No	379	C,D,B,E,A
1948 ...	281	306	306	255	272	No	498	B,C,A,E,D
1949 (Cherry) ...	489	655	483	761	674	Yes	107	D,E,B,A,C
1949 (Clean Coffee)	71	93	78	94	109	No	33	E,D,B,C,A
Average for 9 years (Cherry) ...	584	622	685	739	487	Yes	225	D,C,B,A,E

The results for 1949 show that D (Complete manure), E (no manure) and B (N+P) are on a par and all of them superior to C (N+K) and A (N). In view of the conflicting results obtained from year to year, no reliance can be placed on any single year's results. Dealing with a

perennial crop like coffee, it is justifiable to evaluate the average yields of plots which received practically the same treatment over a number of years. Analysing the averages over a period of nine years, it is found that D (complete manure) is significantly superior to E (no manure), but not superior to other manurial treatments, viz., N, N+P and N+K. These treatments themselves are not significantly superior to 'No manure'. Nevertheless, it may be observed that the trend of average yields is in favour of manures and continues to be of the same order as in the average yields recorded a year ago. Taking absolute figures, the additional return from a 'complete manure' over 'No manure' is only of the order of 252 lb. of ripe cherry per acre the equivalent of 40 lb. of clean coffee. It pays its way under present price levels, but is obviously inadequate for the investment. This confirms the observations made in the last report that the present dosage of 20-30-40 hitherto followed is apparently inadequate and possibly unbalanced even when coffee is grown without competition for plant-food from shade trees. Based on the experience of workers in Kenya, where coffee failed to respond to 20 lb. of nitrogen but responds to 56 lb. nitrogen without change in the quantity of potash and phosphates, it is proposed to alter from the current season the dosage of this ingredient from 20-30-40 to 40-30-40. In a comprehensive manurial experiment which is proposed to be laid down shortly, provision will be made to study the effects of at least three levels of all the three plant-foods.

From the determination of clean coffee made during 1949 it is interesting to note that these figures give a slightly different order in absolute values which suggests that the yield of clean coffee which does not necessarily follow the ranking in the yield of cherry is an important consideration in assessing the value of manurial applications.

Co-operative Manurial Experiments on Private Estates. Series I.

20. Another series of manurial experiments was started in 1939 on a similar lay-out and with the same doses of manures as in the permanent manurials described above. The main differences were that these experiments were conducted on private estates, on mature coffee in bearing, and under natural shade of mixed species. Thus uniformity of plant material under experiment, uniformity of shade and standardisation of basic fertility had to be sacrificed. The experiments were originally designed to provide material for studies on the influence, among other things, of manures on the quality of coffee, but the study of quality was suspended in 1947, and the yield records obtained from 1940 onwards were utilised for the study of yields in relation to manuring. The results obtained during a period of ten years are presented below;

Annual rate of manuring : N : 20 lb. per acre
P_2O_5 : 30 lb. ,,
K_2O : 40 lb. ,,
} Treatment same as in new manurial series at Main Station, Balehonnur.

Area of Experimental plot : 1.43 acres

Lay out . . . Latin square 5 x 5

Variety . . . Kent's Arabica

Shade . . . Natural shade

No. of plants per sub-plot:
Gross : 10 x 7
Nett : 8 x 5

Spacing . . . 6 ft. x 6 ft.

TABLE XII—Results of Co-operative Manurial Experiments.

Expt. 1—Santaweri Estate (Mysore).

Year	Average calculated yield of ripe cherry in lb. per acre — TREATMENTS					Significant or not	Critical difference (P=0.05)	Conclusions
	N A	N+P B	N+K C	N+P+K D	Control E			
1940 ...	1290	1440	1902	1110	2376	No	1170	E,C,B,A,D
1941 ...	1260	1371	1908	1128	2286	No	1429	E,C,B,A,D
1942 ...	2166	2196	1794	1812	2658	No	890	E,B,A,D,C
1943 ...	2352	2616	2664	2538	2580	No	769	C,B,E,D,A
1944 ...	678	522	612	462	732	No	264	E,A,C,B,D
1945 ...	2466	3348	2778	2941	2904	No	766	B,D,E,C,A
1946 ...	3318	3432	3210	2418	2712	No	785	B,A,C,E,D
1947 ...	2352	2460	2484	2520	2628	No	1107	E,D,C,B,A
1948 ...	3702	4194	3420	3000	3636	No	1950	B,A,E,C,D
1949 ...	714	732	738	492	720	No	341	C,B,E,A,D
Average for 10 years ...	2030	2231	2151	1842	2323	No	638	E,B,C,A,D

In this experiment there has been no response to manuring for the tenth year in succession. Even when the averages over ten years are taken into consideration, the results are not significant. The apparent depressing effect of the complete fertilizer mentioned in the last report continues to persist even in the average yields computed for ten years.

TABLE XIII—Results of co-operative manurial experiments. Experiment 2—Watekan Estate (Mysore).

Year	Average calculated yield of ripe cherry in lb. per acre — TREATMENTS					Significant or not	Critical difference (P=0.05)	Conclusions
	N A	N+P B	N+K C	N+P+K D	Control E			
1940 ...	1686	1476	1620	1662	1428	No.	609	A,D,C,B,E
1941 ...	Results not recorded							
1942 ...	930	708	978	672	696	No,	333	C,A,B,E,D
1943 ...	960	1422	1050	834	1116	No,	553	B,E,C,A,D
1944 ...	2244	1884	2352	2892	1950	Yes	750	D,C,A,E,B
1945 ...	2406	2808	2688	2874	3618	No,	1148	E,D,B,C,A
1946 ...	3204	2988	3864	3648	2700	Yes	817	C,D,A,B,E
1947 ...	4158	4224	3966	4014	4842	No,	1637	E,B,A,D,C
1948 ...	1710	960	866	936	936	No,	933	A,B,D,E,C
1949 ...	3936	4164	3858	4185	3516	No.	1047	D,B,A,C,E
Average for 9 years ...	2359	2293	2360	2413	2311	No.	475	D,C,A,E,B

In this experiment there was no response to manuring in seven out of nine years. In 1944 D (Complete manure) was superior to the rest of the treatments and in 1946 C and D were better than B and E. Even when the average yields over nine years are considered, the results are not significant though D (the complete manure) is numerically superior. These results are a pointer to the need for a modification of the doses as outlined earlier in this report.

TABLE XIV—Results of Co-operative Manurial Experiments.
Expt. 3—Kirgandur Estate (Coorg).

Year	Average calculated yield of ripe cherry in lb. per acre					Signi-ficant or not	Critical difference (P=0.05)	Conclusions
	TREATMENTS							
	N A	N+P B	N+K C	N+P+K D	Control E			
1940 ...	1362	1320	1242	1062	1362	No	416	E,A,B,C,D
1941 ...	2562	2106	2286	2796	2124	No	1262	D,A,C,E,B
1942 ...	1088	1020	1338	1008	846	Yes	430	C,A B,D,E
1943 ...	1368	1818	1566	1608	1542	No	528	B,D,C,E,A
1944 ...	5076	5724	5712	4056	4860	No	1286	B,C,A,E,D
1945 ...	4914	3948	3900	4188	3906	Yes	992	A,D,B,E,C
1946 ...	3595	3912	4189	3269	3707	No	852	C,B,E,A,D
1947 ...	3408	3132	4080	4672	3366	No	912	D,C,A,E,B
1948 ...	366	606	330	276	300	Yes	242	B,A,C,E,D
1949 ...	4464	4650	3862	4386	4260	No	922	B,A,D,E,C
Average for 10 years	2820	2824	2851	2732	2527	...	...	...

There is no response to manure in seven out of ten years. Taking the three years when there was some significance, it is found that there was no consistency in the ranking of the treatments. In no year was there any significant response to a complete fertilizer. Computing the average yields for 10 years, it is found that E (control) is numerically the lowest.

TABLE XV —Results of Co-operative Manurial Experiments. Expt. 4—Gargandur Estate (Coorg).

Year	Average calculated yield of ripe cherry in lb. per acre					Signi-ficant or not	Critical difference (P=0.05)	Conclusions
	TREATMENTS							
	N A	N+P B	N+K C	N+P+K D	Control E			
1940 ...	979	937	1047	1211	709	Yes	407	D,C,A,B,E
1941 ...	1924	1802	2103	2572	2700	No	929	E,D,C,A,B
1942 ...	2132	1792	2338	2669	1707	No	1086	D,C,A,B,E
1943 ...	1291	401	564	378	899	No	735	A,E,C,B,D
1944 ...	2814	3492	4200	4248	3294	No	1092	D,C,B,E,A
1945 ...	2148	1494	1956	1428	2070	No	920	A,E,C,B,D
1946 ...	2279	2345	3279	2571	2474	No	1010	C,D,E,B,A
1947 ...	2742	2580	3120	2724	2970	No	468	C,E,A,D,B
1948 ...	126	90	78	54	72	No	83	A,B,C,E,D
1949 ...	3174	3204	3112	3264	3252	No	608	D,E,B,A,C
Average for 10 years.	1961	1819	2182	2112	2015			

There is no response to manure except in 1940, the starting year of the experiment when D is superior to E. The average of 10 years also shows that there is no response to any of the manurial treatments.

Series II.

21. **Bulky v. concentrated manures**:—The results of another series of experiments started in 1939 to study the relative merits of bulky and concentrated manures are as follows:

EXPERIMENT I—*Locality* : *Netraconda* (*Mysore*).

Annual rate of manuring ; N : 20 lb. per acre
P_2O_5 : 30 „
K_2O : 40 „

Area of Experimental plot : 1.83 acres
Variety : Kent
Shade : Natural shade
Layout : Latin square 4 x 4
No. of Plants per sub-plot 13 x 11
Outskirts : One row all round.
Spacing : 6 ft. x 6 ft.

Treatments : *A* ($\frac{1}{2}$ *bulky* + $\frac{1}{2}$ *concentrated Nitrogen*)—Compost to provide 10 lb. nitrogen and the balance of 10 lb. nitrogen as a mixture of groundnut cake and ammonium sulphate *plus* enough superphosphate *plus* sulphate and muriate of potash (in equal quantities) to provide 30 lb P_2O_5 and 40 lb. K_2O respectively.

B (*bulky Nitrogen*)—Compost to provide 20 lb. nitrogen *plus* superphosphate *plus* sulphate and muriate of potash (in equal quantities) to provide 30 lb. P_2O_5 and 40 lb. K_2O.

C (*concentrated Nitrogen*)—15 lb. nitrogen as groundnut cake and 15 lb. nitrogen as ammonium sulphate *plus* superphosphate *plus* sulphate and muriate of potash (in equal quantities) to provide 30 lb. P_2O_5 and 40 lb. K_2O respectively.

D—Control (*No Manure*).

TABLE XVI — Results of bulky v. Concentrated manures.

Expt. 5 — Netraconda Estate (Mysore).

Year	Average calculated yield of ripe cherry in lb. per acre				Signi-ficant or not	Critical difference (P=0,05)	Conclusions
	TREATMENTS						
	Half bulky + half concen-trated A	Bulky B	Concen-trated C	Control D			
1940 ...	424	596	549	502	No	394	B,C,D,A
1941 ...	900	882	824	888	No	579	A,D B,C,
1942 ...	748	743	867	703	No	763	C,A,B,D
1943 ...	112	111	115	173	No	183	D,C,A,B
1944 ...	615	636	712	667	No	403	C,D,B,A
1945 ...	1140	1206	1335	1381	No	468	D,C,B,A
1946 ...	1967	1624	1254	1318	No	932	A,B,D,C
1947 ...	909	1041	1123	902	No	332	C,B,A,D
1948 ...	152	224	127	143	No	86	B,A,D,C
1949 (Cherry) ...	30	1767	1879	1860	No	447	C,D,A,B
1949 (clean coffee)	284	304	323	336	No	97	D,C,B,A
Average for 10 years (Cherry)	880	883	879	854	No	272	B,A,C,D

Though this experiment has been in progress for ten years, the results obtained from year to year, as also the average yields obtained during the period, do not show any response to manuring. These results once again indicate that in the peculiar ecology of coffee *cum* shade, the doses of manures applied are inadequate in whatever form they are applied.

Taking the figures for clean coffee obtained in 1949 the order of absolute yield is changed without, however, any significant difference among them.

22. Observations on setting of blossom and development of berries:

Monthly observations were made during the last three seasons from the opening of blossom to the development of berries in two manurial experiments at Balehonnur. Similar observations were made during two seasons in the co-operative manurial blocks at Santaweri and Watekhan. The observations were made on an equal number of branches of the same age and similar development taken at random in each of the sub-plots. The results are tabulated below:

TABLE XVII—Percentage of berry on blossom.

Treatments	Permanent manurials at Balehonnur			Co-operative manurials			
				Santaweri		Watekhan	
	1947	1948	1949	1948	1949	1948	1949
A : N ..	9.4	17.2	41.6	39.8	39 4	43.2	43,0
B : N+P ..	11.6	16.2	38.0	32.4	32.4	39.2	49.0
C : N+K ..	10.9	12.2	40,2	40.8	46.2	58.0	51.2
D : N+P+K ..	16.8	12.0	39.2	38.2	38.0	56.8	46.4
E : No manure ...	14.4	18.0	30.8	43.2	39.4	51.6	50.6
Significant or not	No	No	No	Yes	Yes	No	No
Critical difference (P=0.05) ...	9.19	12.26	12.05	9.86	9. 08	29 19	48.51
Conclusions ...	D,E,B,C,A	E,A,B,C,D	A,C,D,B,E	E,C,A,D,B	C,A,E,D,B	C,D,E,A,B	C,E,B.D,A

Treatments	Bulky v. Concentrated		
	1947	1948	1949
F : Bulky manure	32.8	31.5	58.5
G : Concentrated	32.5	26.5	52.8
H: ½ bulky + ½ concentrated...	32.3	25.8	56.0
I : No manure ...	29.5	19.3	55.8
Significant or not...	No	Yes	No
Critical difference (P=0.05)	17.3	7.8	12.5
Conclusions -	F,G,H,I	F,G,H,I	F,H,I,G

The above results show that in the permanent manurials at Balehonnur, no one treatment gives higher setting than others. At Santaweri, B (N+P) shows the poorest setting in both years. At Watekhan, there is no significant difference among the five treatments. In the Bulky v. Concentrates experiment at Balehonnur, F (bulky manure) is better than I (no manure) in one out of three years. There is no significant difference in other years. Season and locality are apparently other interacting factors.

23. 'Lights' in relation to manurial treatment.

During the harvest of the manurial plots at Balehonnur and two private estates, the float contents of the produce were determined by weight and by volume in one experiment. Results are tabulated below :

TABLE XVIII—Percentages of floats in manurial treatments 1949.

	Treatment	Permanent manurials Balehonnur		Bulky v. Concentrates (Balehonnur)		Co-operative Manurial experiments	
						Santaweri (Mysore)	Watekhan (Mysore)
		By weight	By volume	By weight	By volume	By weight	By weight
A	N only ...	5.4	3.62	...	...	2.0	2.0
B	N + P ...	3.8	2.91	...	...	1.8	2.0
C	N + K ...	8.0	5.77	...	...	1.8	1.8
D	N + P + K ...	9.8	6.51	...	...	1.2	2.2
E	Control (No treatment)	5.4	7.02	...	...	1.8	2.6
F	Bulk manures			3.75	2.59	...	...
G	Concentrated manure			3.5	4.40	...	...
H	Half Bulky plus half Concentrated ...			5.0	3.35	...	...
I	Control (No treatment) ...			4.25	3.87	...	...
Significant or not ...		No	No	No	No	Yes	Yes
Critical difference ...		7.92	6.06	2.0	1.92	0.689	0.397
Conclusion ...		DCAEB	EDCAB	HIFG	GIFH	ABCED	E,DABC

Though a more correct picture of 'lights' would have been obtained by the determinations of float contents by volume in all the experiments, the results show that by weight there is no significant difference in both experiments at Balehonnur, but at Santaweri treatment D (complete manure) has given significantly the lowest percentage of floats, but at Watekhan, treatment C (N+K) has given significantly lower floats. In the two experiments at Balehonnur in which determination of floats was made by volume, the highest percentage of floats is in the control (no treatment)

24. **Catalysation of plant nutrients.**—The application of inorganic chemicals in the form of iron and manganese salts in very small doses has been observed in some crops to increase the availability of plant-foods. Two experiments on these lines, one at each research station, were started on coffee in collaboration with the Biochemist, Indian Institute of Science, Bangalore. The following treatments were laid out on a latin square design:

A. 28 lb. ferrous sulphate per acre.
B. 20 lb. potassium permanganate per acre.
C. 40 lb. catalyst product prepared by interaction of lime with ferrous sulphate.
D. 80 lb. do do

The catalysts were applied in a finely divided form mixed with the normal mixtures. At Balehonnur the experiment was started in April 1948 and the manurial dose was of the order 20-30-40. At Chethalli, the experiment commenced in April 1949 on a manurial dose of 40-30-40. The first yield records available at Balehonnur do not show any superiority of the catalysts. The experiment is continued.

25. **The influence of Potash on bean quality and yield.** To study the effect of potash on yield, floats, 'jollu' content etc., an experiment was laid out during the year at Chethalli on a latin square lay-out applying three levels of potash (40, 60 and 90 lb. K_2O per acre). Individual plant yields will be maintained and the determinations made of the various categories of floats at all the pickings.

26. **Routine Advisory work.**—Soil samples from nine estates were taken, the following determinations made, and advice rendered on the basis of the results.

Nitrogen	93	Potash	14
Phosphoric acid	13	Soil reaction (pH)	198

III. AGRONOMY.

27. Agronomic experiments consisted in the following:

The study of the influence of pruning on yields; the effect of pruning in relation to spraying; the use of plant hormones for preventing fruit drop, and the study of the behaviour of green manures in established coffee.

EXPERIMENT I—*The effect of pruning on yields*:

TREATMENTS. A—*Light pruning* (Breaking off dry branches, suckering and removing crosswood).
B—*Medium pruning* (Breaking off dry branches, centering, suckering and removal of whippy and blind wood).
C—*Heavy pruning* (All operations under medium pruning *plus* thinning out superfluous branches to alternate the bearing wood on primaries and secondaries).
D—*Control* (No pruning).

Locality	Balehonnur	*Outskirts*	One row all round
Area of Experimental block	2.05 acres		
Variety	Coorg	*Spacing*	6 ft. x 6 ft.
Shade	Natural shade	*No. of plants per subplot*	Gross 8 x 20; Nett 6 x 18
Layout	Latin square 4 x 4		

TABLE XIX—Results of Pruning Experiments.

Year	Yield in lb. of ripe cherry per acre of 1,200 plants				Critical Difference P=0.05	Significant or not	Conclusions
	A	B	C	D			
1940 ...	2265	1594	1660	1754	649	No	A,D,C,B
1941 ...	1213	1064	497	1035	397	Yes	A,B,D,C
1942 ...	1410	956	1622	940	465	Yes	C,A,B,D
1943 ...	431	330	244	319	101	Yes	A,B,D,C
1944 ...	623	363	124	473	185	Yes	A,D,B,C
1945 ...	3600	3480	2961	2981	948	No	A,B,D,C
1946 ...	134	145	128	141	111	No	B,D,A,C
1947 ...	725	507	246	596	239	Yes	A,D,B,C
1948 ...	1432	1606	1689	1289	438	No	C,B,A,D
1949 ...	788	1023	861	864	326	No	B,D,C,A
Average of 10 years.	1262	1107	1003	1037	194	Yes	A,B,D,C

The figures were analysed statistically, and the average yields for ten years show that under Balehonnur conditions light pruning is better than heavy pruning and no pruning, but there is nothing to choose among medium pruning, heavy pruning and no pruning.

EXPERIMENT II.—The effect of pruning in relation to spraying.

Treatments : A — Spraying (Pre-and Post-monsoon treatments).

B — Pruning

C — Spraying *plus* pruning

D — Control

Area of Experimental block : 2.05 acres — *Layout* . . . Factorial design 2 x 2

Locality : Balehonnur.

Variety . . . Coorg — *Outskirts* . . . One row all round

Variants . . . 4

Replications . . . 4 — *Spacing* . . . 6 ft. x 6 ft.

Shade . . . Natural shade — *No. of plants per sub-plot:*

Gross 20 x 8

Nett 18 x 6

TABLE XX—Results of pruning and spraying Experiment.

Year	Yield of ripe cherry in lb. per acre				Significant or not	Critical difference	Conclusions
	A	B	C	D			
1940 ...	2575	2450	2175	2400	No	1113	A,B,D,C
1941 ...	2400	1450	1600	1425	Yes	587	A,C,B,D
1942 ...	800	100	1110	75	Yes	824	C,A,B,D
1943 ...	700	450	350	750	Yes	207	D,A,B,C
1944 ...	791	225	705	192	Yes	457	A,C,B,D
1945 ...	3646	513	3287	536	Yes	558	A,C,D,B
1946 ...	192	619	142	694	Yes	204	D,B,A,C
1947 ...	747	78	433	150	Yes	229	A,C,D,B
1948 ...	2530	1050	2455	988	Yes	486	A,C,B,D
1949 (a) cherry...	1708	850	1502	800	Yes	344	A,C,B,D
(b) clean coffee	289	148	268	143	Yes	111	A,C,B,D
Average of 10 years ...	1609	779	1376	801	Yes	429	A,C,B,D

In seven out of ten years and in the average of ten years, spraying alone has given higher yields than all other treatments. Clean coffee figures for 1949 show that spraying, and spraying plus pruning are superior to pruning or control. There is nothing to choose between pruning and no pruning. Under the conditions obtaining in the locality there is no benefit conferred by pruning. The ten year averages also point to the same conclusion.

28. **Effect of hormones on prevention of fruit drop**—Arabica coffee suffers from fruit drop which is conspicuous in certain seasons, particularly during abnormal weather conditions. Some hormones found useful in orchard practice were tried to study the effect of these on coffee berries. An exploratory experiment on spraying was started in July 1948 on clonal plants of S. 31 and S. 26 with available hormones at an advanced stage in the development of the berries. A further replicated trial including two additional hormone preparations was conducted on seedling plants of Coorg arabica. Special precautions were taken to prevent the spray applied to one plot falling on its neighbour. Counts of fruit drops were taken every week till harvest. The results are furnished below:

TABLE XXI—Effect of plant hormones on the prevention of fruit drop.

	Experiment I.	*Experiment II.*	*Experiment III.*
Locality :	Balehonnur	Balehonnur	Balehonnur
Date of application :	26th July 1948	First spray— 26th July 1948 Second spray— 2nd August 1948	28th to 30th August 1949.
Variety :	S.31 (clonal plants)	S.26 (clonal plants)	Coorg Arabica (seedling plants)
Shade :	Natural	Natural	Natural.
Spacing :	6 ft. x 6 ft.	6 ft. x 6 ft.	6 ft. x 6 ft.
Layout :	5 rows of 8 plants each	5 rows of 8 plants each	Randomised blocks replicated 5 times.
Unit :	Single plot	Single plot	Size of plot : One row of 8 plants.
Area under experiment :	3.33 cents	3.33 cents	16.66 cents.
Variants :	Three as in Expt. I	Three as in Expt. II.	Five as in Expt. III.

Dosage of hormones sprayed :
H. R. 103 = 1 in 10,000 parts (M & B product).
Phyomone = 10 parts per million (I. C. I. product).
Y. F. 1541 = 4 parts per million (I. C. I. product).
Methoxone = 320 parts per million (agroxone liquid).
Quantity = 350 gallons per acre (1200 plants).

TREATMENT	Percentage of fruits dropped		
	Experiment I S. 31	Experiment II S. 26	Experiment III Coorg arabica
A : H. R. 103 ...	...	...	13.8
B : Phyomone ...	14.1	...	11.8
C ; Y. F. 1541 ...	...	...	15.2
D : Methoxone once sprayed	14.0	18.14	18.1
E : Methoxone twice sprayed	...	21.36	12.6
F : Control ...	15.17	21.80	12.6
Significant or not ...	...	...	No
Critical difference ...	...	...	9.95
Conclusion ...	...	...	D,C,A,E,F,B

The results did not show any significant response in any of the treatments. Further experiments were laid out in June 1949 to see whether the application of hormones at an earlier stage in the development of berries would produce a beneficial effect.

29. **Weed Control**—Experiments were started at both stations to study the relative values of several weedicides in the control of weeds occuring on coffee estates. The results of these studies are furnished below :

TABLE XXII—Effect of Weed-killers on coffee estate weeds at Balehonnur (Mysore).

Serial No.	Weedicides	Strengths tried	Plot size	Effect on weeds	Remarks
1	Agroxone liquid	1 gallon in 100 gallons of water (1% strength) per acre.	2.5 cents	Epinasty (twisting and bending of the stem) started within 24 hours. Weeds in the succulent stage killed within 15 to 20 days. Weeds affected are :— *Bidens pilosa, Ageratum conyzoides, Gynura angulosa, Scoparia dulcis, Solanum nigrum, Ipomoea sp.*	Not effective on *Mimosa pudica, Oxalis corniculata, Dioscorea sp.* and grasses.
2	Fernoxone ..	1.25 lb. in 80 gallons of water per acre.	2.5 cents		
3	Extar Sandoz ..	17 lb. in 85 gallons of water per acre.	2.5 cents	Scorching of the weeds seen within 24 hours, but death commences in two to three days.	For being effective a drenching spray is to be given.
4	Shell weed-killer No. 20.	10 gallons per acre	2.5 cents	Contact weed killer, effective in killing all weeds including grass, seedlings of *Lantana, ferns, Mimosa pudica,* and *Oxalis corniculata.*	These are oil weedkillers having effect on all vegetation within a few hours from spraying. The coffee plants should be protected against the drift of the spray.
5	Stanvac weed-killer.	do	2.5 cents		
6	Agroxone dust	200 lb. of 1% dust per acre.	2.5 cents	No perceptible action.	...
7	Shell weed-killer No. 20.	2 gallons emulsified in 8 gallons of water per acre.	2.5 cents	No perceptible action.	The quantity is inadequate for good coverage. Diluted with four times of water, it is ineffective.
8	Stanvac weed-killer	do	2.5 cents		
9	Shell weed-killer No. 20.	40 gallons per acre	5 cents	All the treatments were effective against all the common weeds including *Mimosa pudica* and grasses, treatment 11 being more efficient.	Treatments 9 to 12 (mixing with water and Diesel oil) were tried to obtain complete coverage of the weeds. Dilution with equal quantity of water is effective, whereas with Diesel oil a dilution of 10 of the weedkiller in 30 of diesel oil was equally effective.
10	do ...	20 gallons in 20 gallons of water per acre.	5 cents		
11	do	20 gallons in 20 gallons Diesel oil per acre.	5 cents		
12	do ...	10 gallons in 30 gallons of Diesel oil per acre.	5 cents		

TABLE XXIII—Effect of Weed-killers on coffee estate weeds at Chethalli (Coorg)

Serial No.	Weedicides	Strengths tried	Plot size	Effect on weeds	Remarks
1	Agroxone dust	175 lb. of 1 % dust per acre	10 cents	No effect except slight crinkling	
2	Agroxone liquid	10 lb. in 100 gallons of water (1 % strength) per acre	10 cents	Same as at Balehonnur	
3	2, 4-D ..	100 gallons of 0.1 % strength per acre	10 cents	0.4% and 0.2% were more effective in killing weeds like *Bidens pilosa*, *Ageratum conyzoides* and *Gynura angulosa* at all stages of growth than 0.1%. Effect was perceptible within 12 hours from treatment	Not effective on grasses and *Oxalis cornicula a*
4	do ..	100 gallons of 0.2 % strength per acre	10 cents		
5	do ..	100 gallons of 0.4 % strength per acre	10 cents		
6	Extar Sandoz	18 lb. in 100 gallons of water per acre.	10 cents	Scorches the weeds by its contact action and is very effective on the common weeds like *Bidens pilosa* and *Ageratum conyzoides*	Seems to have residual effect ; very few weeds were coming up after the next rains.

TABLE XXIV—Effect of weedicides on different stages of growth of 'Spanish-needle' (Bidens pilosa) at Chethalli, (Coorg)

Serial No.	Treatment	Stage of growth		
		4-6 leaf stage	Medium growth	Flowering stage
1	Agroxone dust 175 lb. per acre	Slight epinasty	Little effect	Little effect
2	Agroxone liquid 1% (10 lb. in 100 gallons of water)	Killed completely	Killed many of the plants	Slow epinasty and bending of the stem but no death
3	2, 4-D, 0.2 % (100 gallons per acre)	do	Killed completely	Killed completely

Summarising the observations, it is found that among selective weedicides methoxone (MCPA) dust is practically ineffective. While Agroxone in liquid form and Fernoxone at 0.1 per cent strength are effective on common weeds like Spanish-needle (*Bidens pilosa*) *Ageratum conyzoides*, *Gynura angulosa*, *Scoparia dulcis*, *Solanum nigrum* and *Ipomoea sp*, these are not effective against 'touch me not' (*Mimosa pudica*) *Oxalis corniculata* and grasses.

2, 4-D at 0.2% strength is more effective than 0.1 per cent strength.

Extar Sandoz which is a DNOC derivative is a contact weed-killer on all vegetation when a drenching spray is given. The oil products are also contact weed-killers on all vegetation but 10 gallons is very inadequate to cover one acre. Shell weed-killer No. 20 diluted with an equal quantity of water or three times its volume of diesel oil is very efficient when the mixture is applied at 40 gallons per acre. All oil weedicides require very careful handling to prevent injury to coffee.

30. Green manure under coffee shade.—As a complement to the study of green manure crops in the open, trials with a number of leguminous plants were made under semi shade conditions of established coffee, particularly in patches where coffee fails and weeds thrive. Four periodical sowings were conducted to determine the optimum conditions for germination and growth. The results obtained in a one-year period indicate that sowings in April following blossom showers or in late May are the most successful. Soil moisture, temperature and diffused sunlight are optimum at these periods for good germination and early establishment. Though their growth under shade is comparatively poorer than what obtains in the open, the following species by virtue of their quick growth and erect habit were found to withstand the unfavourable conditions of weed competition and shade better than others : *Crotalaria anagyroides*, *Sesbania speciosa* and *Cajanus cajan*.

Among those with a trailing habit, *Centrosema pubescens* was the best. Three important factors that were observed are (1) the seed rate should be higher than 10 lb for small-seeded species for establishing a sufficiently good population to withstand weed competition.

(2) Flowering and seed setting are meagre under shade, hence a seed crop has to be raised elsewhere.

(3) For producing sufficient green matter, growth in two seasons appears necessary.

(4) Root nodule formation is good in all the species. The following table gives the relevant observations recorded.

TABLE XXV--Performance of green manure plants raised in established coffee.

Serial No.	Species	TIME OF SOWING				General performance
		June—Early monsoon	September	November	April—After blossom showers	
	Erect growing types :					
1	*Crotalaria anagyroides* ...	Fairly rapid growth ; withstands heavy monsoon conditions	Slow growth ; improves with bright weather	Poor germination due to want of sufficient moisture	Germinated well and grew up with rains	Quick in growth ; competes with weeds and establishes well. June sown plants set pods with fertile seeds in March-April. Good nodule formation.
2	*C. lantana* ..	Very slow in growth	do ...	Failed ...	do ...	Slow growing ; gets smothered by weeds unless assisted by weeding.
3	*C. fulva* ...	do ...	Failed ...	do ...	do ...	do
4	*C. agatiflora* ..	do ...	do ...	do ...	do ...	do
5	*C. usaramoensis* ...	do ...	do ...	do ...	do ...	Slow growing ; competes fairly with weeds.
6	*C. striata* ..	do ...	do ...	do ...	do ...	do
7	*C. juncea* ..	Germinated well, but died after a month	Germinated well, but died after a month	Germinated well, but died after a month	Germinated well but died after a month	Grows lean and lanky ; dies for want of sufficient light.
8	*Cassia hirsuta* ..	Very slow growth ...	Failed ...	Failed ...	Very slow growing, but improves with rains	Slow growing, requires protection from smothering weeds.
9	*C. tora* ..	do ...	do ...	do ...	do ...	do
10	*Tephrosia vogelii* ..	do ...	do ...	do ...	do ...	Slow growing, competes fairly with weeds.
11	*T. candida* ...	do ...	do ...	do ...	do ...	do
12	*Cajanus cajan* ..	Fairly rapid growth ; withstands monsoon conditions	Slow growth, but improves under bright weather	Poor germination due to want of sufficient moisture	Good germination ; plants improved with the receipt of rains	Comparatively quick growing ; competes well with weeds ; sets pod in March-April, but pods are empty. Good nodule formation.
13	*Sesbania speciosa* ...	do ...	do ...	do ...	do ...	do do ; seeds viable ; good nodule formation.

TABLE XXV—(*contd.*)

Sl. No	Species	TIME OF SOWING				General performance
		June—Early monsoon	September	November	April—After blossom showers	
14	*Sesbania aculeata* ..	Germinated well, but died after a month	Germinated well, but died after a month	Germinated well, but died after a month	Germinated well, but died after a month	Grows lean and lanky ; dies for want of sufficient light.
15	*S. punctata* ..	Very slow growing ...	Slow growth, but improves under bright weather	Poor germination ...	Poor growth, but improves with rain	Slow growth ; does not successfully compete with weeds.
16	*Indigofera tinctorea*	Failed ...	Failed ...	Failed ...	Failed ...	.....
17	*Tephrosia purpurea*	Failed ...	Failed ...	Failed ...	Failed ...	.....
18	*Glycine hispida* ... Trailing types	Germinates well, slow growing, but not spreading	Germinates well, slow growing	Poor germination ...	Germinates well ; slow growing	Dries up after a struggling growth.
19	*Arachis hypogea* ..	Germinates well, slow growing ; but not spreading	Germinates well, but slow growing	Poor germination ...	Germinates well, slow growing	do
20	*Centrosema pubescens* ...	Germinates well and slowly spreads	Slow growth, but improves with bright weather	do ..	Germinates well and spreads slowly	Comparatively hardy and competes with weeds.
21	*Peuraria javanica* ...	Failed ...	Failed ...	Failed ...	Failed ...	.....
22	*Dolichos biflorus* ...	Quick and good in germination, spreads, suppresses weeds	Quick in growth, suppresses weeds	Germination and growth fair	Quick in germination and spreading	Competes well with weeds, but dries up after setting immature pods.

31. Abnormal leaf-fall and fruit shedding during monsoon :—An investigation was started to study the causes of and to formulate control measures against the abnormal leaf-fall and fruit-drop occuring in certain years in heavy S. W. monsoon areas like the Jager valley. In this area which is on the western slope of the Bababudans and subject to long spells of very wet and humid weather and sunless days, the leaf and fruit-fall was observed to be more heavy in fields sprayed with Bordeaux mixture against black-rot. A randomised block of split plot design was laid out at Galikere estate to study the effect of such possible factors as shade, drainage, organic matter contents in the soil and Bordeaux injury. The experiment is in progress.

32. Soil cultivation Experiments :—To find out the most suitable method of cultivation for obtaining enhanced yields in coffee, a replicated experiment in Latin square design was laid out, applying the following treatments :

(1) Trenching 1½ feet depth
(2) Trenching ¾ feet depth
(3) Renovation pitting
(4) Light digging
(5) Heavy digging
(6) Control

During 1949-50 preliminary yields of individual plots will be recorded for standardising the plots prior to carrying out the treatments.

IV. PLANT PROTECTION.

33. The experiment at Balehonnur on the use of linseed oil as a spreading agent with different strengths of Bordeaux mixture was concluded and the results recorded in the last report. The experiments in Coorg with different strengths of Teepol X was continued and a fresh experiment started to compare the relative merits of Teepol X and Albolineum. The results are recorded below :

*EXPERIMENT I.—The use of Teepol X as a spreader.**

Treatments : A — Bordeaux 2-2-40
B — Bordeaux 2-2-40 with ½ oz. Teepol X in 40 gallons
C — Bordeaux 2-2-40 with 1½ oz. do
D — Bordeaux 2-2-40 with 3 oz. do

* The quantities of Teepol X used are the same as was used last year, but in the last report they were wrongly printed as ¼ oz., ½ oz. and ¾ oz. per 40 gallons mixture.

TABLE XXVI—Leaf Counts and yield in lb. of ripe cherry per acre.

Date of observation	A	B	C	D	Significant or not	Standard error	Critical difference	Conclusions
Leaf survival								
Sept-Oct 1946 ...	23.7	32.0	23.2	29.4	Yes	2.96	6.3	B,D,A,C
Feb-Mar 1947 ...	11.1	14.3	14.1	14.2	Yes	1.08	2.3	B,D,C,A
Sept-Oct 1947 ...	23.4	28.5	29.6	29.1	Yes	1.31	2.8	C,D,B,A
Feb-Mar 1948 ...	15.7	16.6	18.4	18.1	Yes	0.89	1.9	C,D,B,A
Sept-Oct 1948 ...	24.6	24.4	25.4	23.2	No	6.27	...	C,A,B,D
Feb-Mar 1949 ...	11.9	13.9	14.7	14.7	Yes	4.01	1.6	C,D,B,A
Yield of ripe cherry in lb. per acre	1948	3520	4840	4440	3680	Yes	...	...	B,C,D,A
	1949	2683	2077	2080	2680	No	16.5	...	A,D,C,B

Bordeaux mixture with Teepol X helps leaf retention in all observations made in September 1948. But the yield figures for 1949 do not show corresponding increases.

34. Another experiment was started in June 1948 to study the relative merits of Teepol X and Albolineum as spreaders added to Bordeaux mixture. The results recorded so far are as follows:

EXPERIMENT *II—Relative merits of Teepol X and Albolineum.*

Locality: Ghattedhulla (Coorg). *Layout*: Randomised blocks 3 x 6.

TREATMENTS. A—Bordeaux mixture 2-2-40.

B—Bordeaux mixture 2-2-40 + 1 oz. Teepol X per 40 gallons.

C—Bordeaux mixture 2-2-40 + 2 oz. Albolineum.

TABLE XXVII—Results of Teepol X and Albolineum as spreaders.

Date of observation	A	B	C	Significant or not	Critical difference	Conclusions
Leaf survival:						
September 1948 ...	22.2	25.8	25.8	No	...	C,B,A
February 1949 ...	11.9	13.5	11.8	No	...	B,A,C
Yield of ripe cherry in lb. per acre ...	2563	2653	2993	No	...	C,B,A

The improvement in effective percentage of leaf survival noted with Teepol X and Albolineum is not up to the level of significance. It is too early to comment on yields.

35. **Bordeaux mixture v. Peronox**:—The experiment started in 1946 to compare Bordeaux mixture of 2.2.40 strength with the proprietary preparation Peronox in three strengths was continued. The results are furnished below:

EXPERIMENT *III—Comparison of Bordeaux mixture with Peronox.*

Locality: Palmad (Coorg) *Layout*: Randomised block 4 x 6

TREATMENTS. A—Bordeaux mixture 2-2-40
B—Peronox 1 lb. in 40 gallons of water
C—Peronox ¾ lb. do
D—Peronox ½ lb. do
} Two sprays per year.

TABLE XXVIII—Results of Field Experiments—Bordeaux v. Peronox.

Date of observation	A	B	C	D	Significant or not	Standard error	Critical difference	Conclusions
Leaf survival								
Sept-Oct 1946 ...	24.4	23.8	21.1	24.0	No	1.60	4.7	A,D,B,C
Feb-Mar 1947 ...	19.1	20.8	17.6	18.2	No	1.10	3.2	B,A,D,C
Sept-Oct 1947 ...	35.6	36.1	32.2	30.2	No	1.90	5.6	B,A,C,D
Feb-Mar 1948 ...	17.8	14.8	16.0	14.7	Yes	0.71	2.1	A,C,B,D
Sept-Oct 1948 ...	18.8	11.4	9.2	9.0	Yes	5 7	2.1	A,B,C,D
Feb-Mar 1949 ...	13.8	11.1	11.5	11.3	Yes	5.5	2.0	A,C,D,B
Yield of ripe cherry in lb. per acre in 1949 ...	4940	3220	3267	3647	Yes	11.8	1242	A,D,C,B

All the three strengths of Peronox are equal to Bordeaux mixture in three out of six observations, but inferior to Bordeaux mixture in one. In the two other observations, Peronox in one lb. and ½ lb. strengths is inferior to Bordeaux, but the ¾ lb. strength is on a par with it. In September 1948, Bordeaux mixture is superior to 1 lb. strength of Peronox, but both these are superior to the lower strengths of the product. Yield figures which were recorded only in 1949, show that Bordeaux mixture is superior to the three strengths of Peronox which among themselves show no significant differences.

36. *Time and Strength of spray :*

This experiment is a continuation of the investigations begun in 1944 in three representative localities in Coorg, viz., Kirgandur (N. Coorg), Luxmi (Central Coorg) and Ghattedhulla (S. Coorg). The main treatments comprised of (1) pre-monsoon spray ; (2) post-monsoon spray and (3) pre *plus* post-monsoon spray. The sub-treatments consisted of two strengths of Bordeaux mixture viz., 2-2-40 and 4-4-40 formulae. The efficiency of the treatments in affording protection against 'leaf-disease' was evaluated in terms of 'effective leaf survival' and resultant yields of ripe cherry. A summary of the results was furnished in the last report. The merits of the main and sub-treatments were found to vary from season to season. In order to get a better perspective of the results, the data for 1949 were analysed in detail to bring out the interactions between locality, period of application and strength of mixture. The results are given below—

TABLE XXIX—Percentage of Leaf survival and yields in relation to Time, Strength and Zone.

Locality : Coorg : Year 1948-49. *Layout* : Split plot design.
Main=3, Sub=2. Replicates=6

Treatments	Mean effective percentage of leaf survival		Yield of cherry in lb. per acre
	Sept.—Oct. 1948	Feb.—Mar. 1949	1948-49
Main-treatments :			
A. Pre-monsoon spray ...	26.6	18.06	943
B. Pre and Post-monsoon ...	26.6	18.98	860
C. Post-monsoon spray ...	12.2	18.44	737
Standard error mean% ...	3.04	2.62	6.4
Significant or not ...	Yes	No	No
Critical difference (P=0.05) ...	1.9	...	...
Conclusions ...	A,B,C	B,C,A	A,B,C
Sub-treatments :			
E. Bordeaux 4-4-40 ...	22.7	18 62	801
F. Bordeaux 2-2-40 ...	20.8	18.27	893
Standard error mean % ...	3.04	1.46	6.1
Significant or not ...	No	No	No
Critical difference (P=0.05) ...	1.9		..
Conclusions ...	E,F	E,F	F,E
Zone :			
K. Kirgandur ...	25.4	19.46	1175
L. Laxmi ...	19.2	13.90	818
G. Ghattedhulla ...	20.7	22.12	548
General mean per plot ...	21.8	18.49	847
Standard error mean % ...	3.04	2.62	8.4
Significant or not ...	Yes	Yes	Yes
Critical difference (P=0.05) ...	1.9	1.40	207
Conclusions ...	K,G,L	G,K,L	K,L,G
Interactions :—1st Order			
Time x zone ...	Significant	Not significant	Not significant
Strength x zone ...	Not significant	—do—	—do—
Strength x time ...	—do—	—do—	—do—
Interaction :—2nd Order			
Time x strength x zone ...	Not significant	Not significant	Not significant

Significant interactions :
Time x zone

	A	B	C	*Conclusions*
K	30.3	30.1	15.8	A B, C
L	22.7	21.8	13.4	A B, C
G	25.8	28.2	7.2	B A, C
Conclusions	K, G L	K G, L	K L, G	

Standard error : 8.18
Significant or not ? Yes
Critical difference : 3.3

Taking the main treatments, the September observations show that pre-monsoon and double spray are on a par and significantly better than post-monsoon spray. On the other hand, the February observations show that the three main treatments are on a par. These differences are not reflected in the yields. Taking sub-treatments, the higher

strength of Bordeaux does not confer greater protection either in terms of leaf survival or yields. In respect of zones, Kirgandur gives higher leaf survival in the September counts followed by Laxmi and Ghattedhulla which are on a par, but in February observations, Kiragandur and Ghattedhulla are superior to Laxmi. In the matter of yields Kirgandur leads, followed by Laxmi which again is better than Ghattedhulla. The conclusion drawn from 1949 results is that there is interaction between time and locality with the result that the time of application does not produce the same results in the three localities. Combining the above observations with the results of previous years, it is found that locality and season are important considerations influencing the effects of the time of application and the strength of the mixture. It is remarkable that even within the orbit of a small province, seasonal effects are conspicuously varying even when controllable conditions are equal.

37. Black-rot—*Pellicularia* (*Corticium*) *koleroga*:—Two experiments were started during the last season to study the effects of handling coffee bushes and spraying them as a protection against black-rot. In the first experiment which was laid out at Byneheddal in a split plot design, the main treatments were:

(1) Pre-monsoon spray; (2) Monsoon spray; (3) Control. The sub-treatments comprised of (a) handling and (b) no handling. Handling consisted in the removal of debris of previous infection from the crown of the bushes. As black-rot did not appear up to end of August, the experiment was abandoned. A second experiment was started at Balehonnur in August 1948 in a block of coffee where infection had started. The following treatments were done in a randomised block:

(1) Handling only; (2) Spraying only;
(3) Handling and spraying; (4) Control.

The observations made showed that Bordeaux spray applied during monsoon could arrest the spread of the disease. Handling without spraying reduced the source of infection by contact, but it did not provide protection against further development of the disease. Advantage was taken of the occurrence of 'black-rot' on the station to study its incidence on different species and varieties of coffee. The following were the observations.

Resistant	Moderately susceptible	Very susceptible
C.stenophylla	*C.robusta*	*C.bengalensis*
C.arabica		*C.zanquebariensis*
C.quillou		*C.eugenoides*
C.abeocuta		
C.excelsa		
C.liberica		
C.arabica (*Baramasi*)		

NOTE :—Among the selections of Arabica on the Station, none was found free.

38. Seed dressings for protection of germinating seedlings :—The germination of seed coffee varies in various localities depending largely on soil conditions and weather. As these failures are attributable to pre-germination and pre-emergence damage, an experiment was laid out to assess the value of an organic mercurial seed dressing viz. Agrosan GN.

TABLE XXX—Effect of Agrosan GN on the germination of arabica coffee seeds.

Locality : Balehonnur *Material* : Kents arabica @ 100 seeds per plot.

	Set. I.	*Set. II.*
Lay-out : Randomised blocks Replications	6 times	8 times
Treatment : As in the table	4 ,,	3 ,,
Observations	After 83 days	After 93 days

	Treatment	Percentage of seeds germinated	Significant or not	Critical difference
Set I	A. Agrosan GN @ 4 oz. per bushel	89.5	No	5.2
	B. do @ 8 oz. do	88.9		
	C. do @ 16 oz. do	89.7		
	D. Control (no treatment)	91.0		
Set II	A. Agrosan GN @ 2 oz. per bushel	88.8	No	7.0
	B. do @ 4 oz. do	91.6		
	C. Control (no treatment)	93.9		

In this experiment the germination of the control was not affected by soil organisms. Treatment with Agrosan GN which is a proprietary seed dressing has not affected the germination of the seeds and hence could be used as a protection for the seeds against soil infection in old nursery beds and other infected soils.

39. **Brown root disease** :—The work on this disease was done by the grant of a fellowship granted from the funds of the Research Department to the Madras University. The work is done under the direct supervision of Dr. T. S. Sadasivan, Director of the University Botany Research Department, who is in periodic consultations with the Board's Research Department. Preliminary work consisted in the study of organisms isolated from diseased coffee roots. A detailed study of some species of Fusarium constantly occurring on diseased roots has been completed. The study of species of Fomes is under way.

40. **Organic fungicides v. Bordeaux** :—An experiment was started at Balehonnur in May, 1949, to compare Bordeaux mixture with the modern organic fungicide Dithane for the control of the leaf-disease. The plots were laid out in AB, BA pattern replicated six times with the following treatments:

A—Dithane D-14	2 quarts	per 100 gallons of water
Zinc sulphate	1 lb.	
Hydrated lime	½ lb.	
Teepol X	1¼ oz.	
B—Bordeaux	2-2-40	
Teepol X	1¼ oz.	

The results are being recorded by periodical counts of infected leaves by the random sampling method.

41. **Coffee pests** :—White stem borer (*Xylotrechus quadripes* Chev.). The experiment started in 1946 was continued. During the first two years a proprietary product containing 50% D.D.T. was swabbed on the stems in the form of a water suspension twice a year one in each flight period of the adult. B. H. C. containing 5 per cent benzene hexachloride with 0.5 per cent of the gama isomer was dusted on the stems at the rate of 6 to 12 lb. per acre per treatment. These treatments were modified in 1948 using the following formulations:

D. D. T.		*B. H. C.*	
70 to 80% D. D. T.	... 4 lb.	50% B. H. C. (with 6.4% of the gama isomer)	... 4 lb.
Gum arabic	... 2 oz.		
Gelatine	... 2 gms.	Water	... 40 gallons.
Water	... 40 gls.		

Borer infested trees were collected and burnt once a year. The results are furnished below:

TABLE XXXI—Field experiments on insecticidal control of stem borer.

Locality : Ghattedhulla (Coorg) *Lay out* : Randomised block

Serial No.	Number of stem	D. D. T.	B. H. C.	Control
1.	Number of trees ...	2197	2194	1601
2.	Percentage of infection in 1947-48 ...	2.7	1.5	4 .2
3.	Progressive percentage of infection in 1948-49 ...	7.7	4.3	16.0

It is found from the results that both treatments give considerable protection, but B.H.C. is apparently more efficient.

Based on the above results a randomised replicated experiment has since been started at Biccode estate in Hassan district where borer infection is known to be very high.

V. MISCELLANEOUS CROPS

42. I. Subsidiary crops (a) *Paddy* :—Paddy was raised on six acres of swamp land at Chethalli and 1.20 acres at Balehonnur. Thirty out of 48 *batties* of G. E. B. 24 paddy raised at Chethalli were sold at a premium as seed paddy to the Coorg Department of Agriculture. An effort to raise a rain-fed crop of paddy in young clearings of coffee at Balehonnur resulted in practically a total failure very largely due to rabbit damage in the earlier stages and the smothering effect of coffee land weeds.

(b) *Subsidiary food crops* :—Specimen crops of *jola* (*Sorghum vulgare*) and root crops like Cassava (tapioca), elephant foot yam (*Amorphophallus*), Chinese yam (*Dioscorea*), Colocasia, Alocasia, Irish potato and Coleus were raised successfully for multiplying planting material.

(c) *Vegetables* :—Exotic and indigenous vegetables were grown at both stations to meet the needs of the residents of the colonies.

(d) *Fruits* :—At Chethalli, 40,000 oranges were picked and sold through the Coorg Orange Growers' Co-operative Society, Ltd., and Rs. 812 realised. Young plants of apple, peach, pear, persimmon, mangosteen, durian, papaya, tree-tomato, Cape goose-berry, nutmeg and passion fruit were added to the orchard at Balehonnur.

(e) *Spices* :—Ninety-five pounds of pepper was picked at Balehonnur and sold through the Mysore Coffee Curing Works, Ltd., Chikmagalur.

(f) *Miscellaneous products*:—275 lb. of *Seegai* (soap-nut) was collected from the main station and sold.

II. Plant introductions. (a) *Shade trees* :—Seeds of *Maesopsis eminii* and *Erythrina tomentosa* were obtained from ~~Kenya~~ Nairobi, seedlings raised and distributed to both stations.

(b) *Other crop plants* :—Seeds of tung-oil tree (*Aleuritis montana*) were obtained, and 71 seedlings were planted at Balehonnur and 30 at Chethalli. Seeds of Cardamom selections from the Madras Cardamom Research Station in Tinnevelli district were obtained, seedlings raised

and transplanted at Balehonnur. Chichory seeds were obtained from Coimbatore and a specimen crop raised at the main station.

VI. ESTATE MANAGEMENT

43. Both stations joined as subscribing members of the U.P.A.S.I. and its labour department. The Director and the Agronomist joined as the personal members of the local planting associations and attended their meetings regularly.

44. **Labour** :—The average labour strength was 121 at Balehonnur and 129 at Chethalli. The average turn-out per day was 81 at Balehonnur and 70 at Chethalli. Food grains were stocked and supplied to the labour force at concessional rates. The dearness allowance was raised from Re. 0-1-0 to Re. 0-3-0 per day at Balehonnur in confirmity with the decisions of local planters' associations. Besides the completion of two blocks of modern labour quarters at Balehonnur, the construction of three blocks of labour quarters was commenced at Chethalli.

45. **Medical and health** :—Medical aid at both stations was rendered as previously by the part-time services of local medical officers of the Mysore and Coorg administrations. Besides this, a lady sub-assistant surgeon from Koppa made fortnightly visits to Balehonnur to attend to cases of illness among women and children.

Spraying of residential and other buildings with D. D. T. and the weekly administration of paludrine were done as routine measures. The health of the staff and labour force at both stations was unprecedentedly satisfactory.

46. **Lighting and water supply** :—A new 25 KVA electric generator was installed at Balehonnur and all buildings including labour quarters were progressively electrified. The water supply system at Balehounur was augmented by the construction of a 12,000 gallon concrete storage tank, the installation of a new motor-driven pumspet and the extension of pipe lines to the labour quarters.

47. **Manuring** :—Sixty-eight acres of the bulk crop of coffee at Balehonnur and 15 acres at Chethalli were limed at the rate of half ton per acre. 105 acres at Balehonnur and 45 acres at Chethalli were manured at the old rate of 20-30-40. An area of 20 acres at Chethalli was given the modified dose of 40 lb. nitrogen to be followed by 30 lbs. phosphoric acid and 40 lb. of potash. An innovation tried during the year was the application of the phosphate and potash ingredients in shallow trenches between rows of coffee instead of applying these mixed with nitrogenous

manures and applying the mixture in a band around the plants on the surface of the soil.

48. Spraying :—56.25 acres at Balehonnur and 30 acres at Chethalli were given the pre-monsoon spray with 2-2-40 Bordeaux mixture. 65.75 acres at Balehonnur and 30 acres at Chethalli were given the post monsoon spray.

49. Borer control :—At Balehonnur, 714 borer infested trees were dug up and burnt as against 1,042 during the previous year. At Chethalli 4,000 bored trees were destroyed as against 12,000 during the previous year.

50. Harvest :—The following are the harvest figures for the two stations :

	Balehonnur		*Chethalli*	
	Bushels	*Seers*	*Bushels*	*Seers*
Parchment ...	183	24	...	...
Arabica cherry ...	622	5¼	1334	24
„ gleanings ..	67	20¾	54	0
„ bits ...	1	15½	...	...
Robusta cherry ...	205	14	11	0
„ gleanings ...	2	7	...	...
Other species ...	4	14	...	...
Total approx. ...	(9 tons 10 cwts.)		(11 tons 2½ cwts.)	

51. New equipment :—One pulping machine was purchased for each of the stations in order to cope with the increased crop and to prepare larger quantities of parchment. The sub-station was provided with a platform balance, one steel yard, one Jumna lift pump, a soil augur, a flame gun, a power sprayer, a calculating machine, a bicycle and a jeep.

VII. GENERAL.

52. Ad hoc Committees :—Three meetings of the committee for Chethalli and one meeting of the Balehonnur committee were held during the period. All matters pertaining to estate management, construction of buildings and the outlines of research work were discussed at these meetings. The minutes of these meetings were recorded and regularly communicated to all members of the research committee and any comments made by individual members further circularised or placed before the research committee. The valuable experience of the members of these committees and the useful suggestions made by them were of immense help to the administration in formulating the policies for the efficient working of the station and the basic planning of experimental work.

53. **Visitors** :—Sardar Bahadur Sir Datar Singh, Kt., F.R.S.A., Chairman of the Indian Coffee Board, inspected the headquarters station on 14th May, 1949 and laid the foundation stone of the new research laboratories. The following were among other distinguished visitors to the two stations :

(i) *Balehonnur* :—The hon'ble Sri H. Siddiah, Minister for Finance, Public Works and Agriculture and Chairman of the Research Committee; The hon'ble Sri T. Mariappa, Minister for Home Affairs; The hon'ble Sri K. T. Bhashyam, Minister for Law and Labour; The hon'ble Sri P. Subbarama Shetty, Minister for Muzrai and Municipalities; Sri K. P. Ramanathayya, Dy. Commissioner, Chikmagalur; Dr. Zal R. Kothawala, Dairy Development Adviser to the Government of India; Mr. C. I. Machia, Director of Propaganda and Chief Coffee Marketing Officer, Indian Coffee Board; Mr. K. H. Srinivasan, Director of Agriculture in Mysore and Janab Mohomed Ahmed, Dy. Commissioner, Chikmagalur.

(ii) *Chethalli* :—Dr. G. S. Cheema, Fruit Development Adviser to the Government of India and Dr. B. S. Kadam, Director of Tobacco Research.

Besides these, several coffee planters from Mysore, Coorg, Nilgiris and Shevaroys and some members of the Coffee Board visited one or both of the Research Stations.

54. **Conferences and Exhibitions** :—The Research department participated in the U. P. A. S. I. Scientific Conference in August 1948 at Coonoor and the exhibitions at Chikmagalur (Mysore) and at Ammathi (Coorg). Officers of the research department spoke at the meetings of the planters associations on specific scientific subjects and acquainted these associations with the general progress of research.

55. **Staff Meetings** :—Two staff Meetings were held at the headquarters station to draw up the annual programme of work, preparation of budget and for formulating general policies of research and administration. All senior officers of the two research stations and junior officers of the headquarters station attended these meetings.

56. **Library** :—During the year 28 scientific journals besides those received in exchange were subscribed for. A sum of Rs. 2,689 was spent for the purchase of books for the two stations.

57. **Co-operative society** :—The co-operative society at the Coffee Research Station, Balehonnur, did not function satisfactorily during the year. The residents had therefore, to depend largely on extraneous sources for their day to day needs.

58. **Correspondence** :—The number of correspondence dealt with during the year at the headquarters station was as follows: inward—4220; outward—6835.

59. **Audit of accounts** :—The accounts of the two stations were audited by Messrs Fraser and Ross.

60. School :—The primary school at Balehonnur continued to function catering to the needs of the children of the estate residents.

61. Annual celebrations :—The birthday of H. H. the Maharaja of Mysore was celebrated by granting a holiday with wages and providing games and sports competitions for the labour force and the award of prizes. This was followed by a feast for all residents and their families. Independence Day was similarly celebrated at both stations. The labour force was given advances and other facilities for celebrating annual religious festivals.

62. Publications :—The quarterly report of the Research Department which reviews the salient features of the work done during each three-month period, formed a feature of the *Indian Coffee Board Monthly Bulletin*. The following papers were contributed to the Bulletin by the Research Department.

	Subject	*Author*
1.	Nursery Practices in Coffee Culture	... R. L. Narasimhaswamy
2.	The Coffee Stem Borer	... T. V. Pattabhiraman
3.	The exploitation of Plant variability for the improvement of yield in Coffee	... K. M. Thomas
4.	Does Coffee suffer from Bordeaux injury ?	... K. M. Thomas
5.	Coffee Selection Part III	... R. L. Narasimhaswamy
6.	How to take and send samples of soils and manures for Analysis	... N. G. Chokkanna
7.	The Coffee Berry Borer (*Stephanoderes hampei* Ferr.)	K. M. Thomas.

Other Publications :—The annual report for 1947-48 was issued as Bulletin No. 1 and the article on Nursery Practices in Coffee as leaflet I of the Research Department. The article entitled ' How to take and send soil samples and manures for Analysis ' was also reprinted as a leaflet.

63. Acknowledgements :—The loyalty and co-operation I received from my staff are thankfully acknowledged. It is a pleasure to record my gratitude for the courtesy and consideration I received from the Chairman, Vice-chairman and members of the Board, particularly the members of the Research Committee. My special thanks are due to Mr. C. I. Machia and other colleagues at the headquarters of the Board for unstinted help and prompt assistance which rendered my task easy. To the many scientists and heads of Research institutions in India and abroad from whom I received prompt assistance in the matter of exchange of publications and valuable seed material, I am indebted. I should also express my appreciation for the generosity of many South Indian planters who continued their co-operation in the conduct of field experiments and for the many exchange of views. Finally, I should be failing in my duty if I do not express my appreciation of the traditional hospitality which my staff and I have received at the hands of the planting community.

K. M. THOMAS
Director of Research.

APPENDIX I.

Statement of accounts of the Research Department for 1948-49.

RECEIPTS

Particulars	Original estimates Rs.	Revised estimates Rs.	Actuals Rs.	a.	p.	Remarks
1. Coffee and other produce ...	40,000	58,570	44,831	8	2	Includes Rupees 38,860-2-5 credited directly to the a/c of the Secretary, Indian Coffee Board on account of coffee sent to pool.
2. Sale of foodgrains and food supplements	18,000	11,500	11,430	1	11	
3. Provident Fund	3,230	1,020	995	8	0	
4. Recovery of labour advance ...	10,500	9,350	7,766	11	9	
5. Loans recoverable	...	3,000	...			
6. Miscellaneous receipts	...	1,000	1,067	11	3	
Total ...	71,730	84,440	66,091	9	1	

EXPENDITURE

NON-RECURRING :					
A. *Estate :*					
1. Buildings ...	1,66,000	55,000	29,208	5	1
2. Purchase of land ...	10,000	1,500	...		
3. Estate equipments ...	5,000	10,480	9,736	7	6
Total ...	1,81,000	66,980	38,944	12	7

Particulars	Original estimates Rs.	Revised estimates Rs.	Actuals Rs.	a.	p.	Remarks
B. *Research*:						
4. Buildings ...	2,50,000	1,31,000	41,056	0	4	
5. Machinery for Power & Light ...	35,000	35,000	24,594	5	3	
6. Laboratory equipment & furniture ...	95,000	14,000	5,030	2	9	
7. Water supply (tanks & fittings) ...	14,000	14,000	3,684	14	3	
8. Office equipment ...	3,000	3,000	1,033	12	3	
9. Jeep & Radio ...	5,000	6,000	2,029	0	0	
Total ...	4,02,000	2,03,000	77,428	2	10	
RECURRING:						
A. *Estate*:						
1. Pay of staff ...	10,548	7,200	6,500	12	0	
2. War & Dearness allowances ...	4,800	3,180	2,827	0	0	
3. Cultivation charges ...	52,500	57,000	61,173	8	11	Due to increase in D. A. at Balehonnur Station.
4. Labour advance ...	10,500	10,500	9,300	8	6	
5. Provident Fund ...	115	50	...			
6. Leave & Pension contribution ...	1,692	690	...			
Total ...	80,155	78,620	79,801	13	5	
B. *Research*:						
7. Pay of officers & staff ...	63,250	35,970	36,091	15	4	
8. Leave & Pension Contribution ...	1,998	2,070	525	0	0	
9. Travelling allowance ...	6,500	7,000	5,989	9	0	
10. Research fellowship & aids to Universities ...	...	750	* 1,295	1	6	* The difference is due to certain payments which were anticipated for 1949-50, but had to be paid at the end of 1948-49. The amount sanctioned for this purpose i.e., Rs. 2,500 has not been exceeded.
11. Provident Fund ...	3,120	740	326	1	0	
12. War & Dearness allowance ...	19,320	9,200	8,724	6	8	
13. Laboratory expenditure ...	10,000	9,250	10,936	12	5	
14. Field experiments ...	10,000	10,190	11,768	5	9	
15. Library & publications ...	3,500	2,500	3,186	7	9	
16. Postage & stationery ...	3,000	3,500	3,160	2	9	
17. Water & light ...	7,000	6,500	7,050	13	0	
18. Medical facilities ...	3 000	3,200	2,707	6	9	
19. Rent, Tax & Insurance ...	1,000	1,000	1,637	1	5	
20. Upkeep of buildings ...	3,000	2,500	1,912	5	9	
21. Purchase of foodgranis ...	18 000	17,000	† 19,067	13	9	† Increase due to increased cost of foodgrains fixed by the Government.
22. Contingencies ...	3,000	9,000	‡ 12,012	2	4	
23. Hospitality Fund ...	--	300	75	10	11	‡ Increase due to higher cost of transportation & other charges.
Total ...	1,55,688	1,20,670	1,26,467	4	11	

APPENDIX II (a)

Rainfall record of the Coffee Research Station, Balehonnur (Mysore)

Month	Rainfall recorded in inches during										Average for 10 years	Rainfall recorded in 1948-49 in inches
	1938-39	1939-40	1940-41	1941-42	1942-43	1943-44	1944-45	1945-46	1946-47	1947-48		
July ...	25.60	37.73	29.94	32.16	45.95	47.43	41.61	37.52	35.80	35.97	37.97	30.93
August ...	15.79	18.82	33.85	21 31	20.14	9.89	10.9	10.72	37.93	30.34	20.94	39.49
September ...	6.58	3.59	3 07	5.34	5.39	16.11	2.92	9 11	11.51	9.80	7.34	6.43
October ...	2.32	13.09	7.71	8.76	7.18	15.29	12.42	4.25	3 56	2.62	7.72	6.80
November ...	0.80	3.83	7.05	0.21	0.21	2.53	2.71	1.08	7.04	1.14	2 66	8 59
December ...	0.04	0.00	0.70	2.22	1.37	0.01	0.07	0.00	1.09	0.91	0.64	0.08
January ...	0.10	0.00	0.05	0.00	0.47	0.03	0.00	0.00	0.36	0.26	0 13	0.00
February ...	0.00	0.08	0.00	0.00	0.00	1.00	0.00	0.03	0.00	0.00	0.11	0.00
March ...	0,12	0.00	1.05	0.00	0.15	0.60	0.00	0.52	1.86	0.19	0.45	0 44
April ...	2.56	2.84	1 66	4.63	2.06	1.04	3,92	9.05	1.56	9.94	3.93	2.16
May ...	0.67	6.77	4 46	5.49	11.76	5.78	2.73	4.28	5.21	2.41	4.55	6.61
June ...	8.35	22.91	24.34	19.52	13.47	7.81	8.65	23.53	9.90	15.67	15.42	10.50
Total ...	62.93	109.56	123.88	99.64	108 15	107.52	85.82	100.09	125.82	109.25	103.26	111.43

APPENDIX II (b)

Rainfall record of the Coffee Research Sub-Station, Chethalli (Coorg)

Month	Rainfall recorded in inches during										Average for 10 years	Rainfall recorded in 1948-49 in inches
	1938-39	1939-40	1940-41	1941-42	1942-43	1943-44	1944 45	1945-46	1946 47	1947-48		
July ...	15.83	21.93	23.50	16.06	26.93	31.45	36.00	30.84	10.71	23.35	23.66	12.43
August ...	8.84	14.26	18.20	12.91	12.29	4.69	4.93	7.64	24.91	18.85	12.76	21.51
September ...	6.55	2.94	2.96	6.36	3.91	8.91	1.83	3.50	8 25	8.64	5.38	3.59
October ...	9.93	10.58	7.10	4.22	5.84	11.50	6.04	4.63	3.93	9.98	7.37	3.64
November ...	1.33	5.06	8.39	1.42	0.42	6.55	4.00	2.09	6.16	0.13	3.56	5.22
December ...	0.24	0.00	0.67	1.88	1.01	0.00	0.51	0.00	2 31	1.05	0.77	0.09
January ...	0.20	0.02	0.00	0.00	1.24	0 00	0.00	0 00	0 00	0.50	0.20	0.03
February ...	0.00	0.00	0 00	0.00	0.16	1.05	0.00	0.00	0.72	0.40	0.23	0 00
March ...	0.03	0.00	4.61	1.78	0.42	0.33	0.00	2.02	0.00	0.00	0.92	0.02
April ...	4.41	6.55	3.70	3.02	2.16	0.87	7.38	8.32	1.53	4.75	4.27	3.78
May ...	3.53	4.90	5.10	8.55	11.78	1.40	2.29	1.35	4.69	3.80	4.74	11.02
June ...	7.06	22.02	19.24	14.77	9.10	7.02	10.35	13,59	7.31	10.53	12.10	6.85
Total ...	57.95	88.26	93.48	70.97	75.26	73.77	73,33	73,98	70.52	81.98	75.96	68.18

APPENDIX III.

Meteorological data observed at the Coffee Research Station, Balehonnur (Mysore) during 1948-1949.

Serial No.	Meteorological observation	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	Remarks
1.	Highest Maximum temperature O°F ..	77.5	80.5	79.5	82.5	82.0	81.0	84.0	88.5	96 0	91.0	91.0	82.0	
2.	Lowest minimum temperature O°F ...	62.0	63.6	62.5	62.0	60.0	52.0	53.0	57.0	59.0	62.5	63.0	63,0	
3.	Average maximum temperature O°F ...	72.9	72.7	75 1	79.3	79.5	77.8	80.75	83.94	90.13	86.82	82.13	74.8	
4.	Average minimum temperature O°F ..	65.4	65.4	64.7	64.9	64.0	57.6	57 7	59 89	64.77	66.48	66.68	65.9	
5.	Highest number of hours of bright sunshine ...	6.1	6.5	10.0	10.0	10.24	10 5	10 6	10.80	10.40	10.6	11.30	9.30	
6.	Lowest ,, ,, ,, ...	0.0.	0.0	0.0	1.6	2.0	6.0	8.18	8 0	3.86	5.0	0.20	0.00	
7.	Average ,, ,, ,, ...	0.6	1.5	4.43	6.1	6.45	9.0	9.99	9.37	8.84	8.6	6.63	3.40	
8.	Total rainfall for the month in inches ..	30.33	39.49	6.43	6.80	8.59	0 08	...	...	0.44	1.97	6.61	10.50	
9.	Number of rainy days during the month ..	31	28	18	10	6	...	...	...	1	4	16	27	

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